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Alleged Thefts of Electricity.

THE fact that cases or, at any rate, reported cases of alleged thefts of electricity are comparatively rare, may often be a reason for believing that the practice of stealing current from the mains is not very common. But it is a probability or difficulty against which those who supply electricity must continually be on their guard; and the necessity for vigilance increases not only with the number of consumers, but with the extension of supply to persons who, in these days of popular electrical pursuits, are acquiring sufficient knowledge to enable them to "dodge the meter."

A recent case decided in Scotland, which was noted in these columns a week or two ago, seems to indicate that some change in the law may be necessary if electricity undertakers are to be adequately protected. A man was charged with altering the index of a meter under his custody and control with a view to fraudulently preventing it from duly registering the quantity of electricity supplied. There was evidence to show that the meter in question had been tampered with.

In the language of the Sheriff who tried the case: "It was discovered that the pointer of the third or 'hundreds' dial on the index had been forced backwards, so that it did not synchronise with the pointers of the second and fourth dials. On the index plate a scratch was seen which was apparently made by the instrument used to force back the said pointer." The learned Sheriff then went on to say that as the meter had at all material times been on the premises of the accused, who was the only person who stood to benefit by the alteration of the index, it might be a natural inference that he made the alteration. But he then pointed out that, the evidence being purely circumstantial, a conviction could only follow if the circumstances should lean, not merely naturally to the inference that the accused was guilty, but so conclusively that no reasonable person could refuse to draw it. As he felt it conceivable that the malice or mischief of some other person who obtained access to the meter

had caused the alteration, he felt he was unable to convict on this ground.

Pausing here, there can be no doubt that the learned Sheriff made an accurate statement of the criminal law as it applies not only in Scotland, but also in England. A usual example of an "irresistible presumption" which is given by those who teach the law is this: "If a man is seen coming out of a public-house wiping his mouth with the back of his hand, there is an irresistible presumption that he has had a drink." Whether the learned Sheriff was right in deciding that the presumption of guilt did not arise, is another matter, upon which another tribunal might differ from him; but the case as formulated against the renter of the meter did not stop there. The prosecution relied on the final paragraph of Section 38 of the Gas Works Clauses Act, 1871, upon which the complaint was made. It reads: "The existence of artificial means for causing such alteration or prevention, or for abstracting, consuming, or using electricity of the undertakers when such meter is under the custody or control of the consumer, shall be *primâ facie* evidence that such alteration, &c., as the case may be, has been fraudulently, knowingly, and wilfully caused by the consumer using such meter." While recognising the force of this provision, the learned Sheriff pointed out the obvious fact that the prosecution had not proved the existence of any "artifice or device," as, *e.g.*, a bypass or short circuit. Consequently this clause did not throw upon the accuser the burden of disproving anything. In the result the charge was held "not proven." Curiously enough, reliance upon this final paragraph in Section 38, so far from increasing, may have done something to lessen the chances of securing a conviction in this particular case. The criminal law is at all times very jealous of the principle that every charge shall be proved against the accused person. He need say nothing: the whole of the facts must, as a rule, be established by affirmative evidence led against him. In certain cases, however, the onus of proof is shifted. Thus, on a charge of "receiving," it is sufficient to prove that a man is in possession of stolen goods. He must then explain affirmatively how they came into his possession. So in the case under notice, certain things are roundly declared to be *primâ facie* evidence against the accused, and the very fact that the statute says "this particular thing" (*i.e.*, the presence of a short circuit) *shall be primâ facie* evidence, raises the presumption that no other "particular thing" (*i.e.*, the actual reversal of the meter and the scratch on the dial) shall be *primâ facie* evidence. As the lawyers say, *Expressum facit cessare tacitum*.

Enough has been said to justify the view that the decision in the case before us was right and in accordance with law. Yes; but what law? The provisions of an Act of Parliament adopted from an earlier measure intended to regulate the supply of gas, and passed in the year of grace 1899! Notwithstanding the experience of nearly three decades, it never seems to have occurred to anyone that the machinery for preventing fraud in relation to the supply of electricity might be overhauled and improved. Let one suggestion suffice. What honest man would suffer if it were enacted that: "The fact that any meter shall have been opened otherwise than by or with the authority of the undertakers while such meter is in the custody or control of the consumer, shall be *primâ facie* evidence that such alteration or prevention, &c. (*as the case may be*) has been fraudulently, knowingly, and wilfully caused by the consumer using such meter"? The Legislature last year rushed through Parliament an Act which *may*, in the long run, enure for the benefit of those who supply and consume electricity, and which *must* be fraught with considerable outlay. Would it be too much to ask them to introduce one small reform which *must* assist the detection of fraud, and is almost certain to involve little or no expense? But there is little *kudos* attaching to a one-clause Act of Parliament!

The Future of the Fair.

We notice an editorial in *The Times* Trade and Engineering Supplement regarding the future of the British Industries Fair. Our contemporary discusses a point which has been considered in our own pages and in many conversations that have taken place during the last year or two. Recognising that the London part of the Fair has now outgrown the accommodation available at the White City, the writer mentions as possible alternatives the building of a Fair Hall at a cost of £500,000, the scattering of various sections in separate buildings, thus making a number of decentralised little exhibitions, the preparation of additional buildings at the White City, or removal to the Crystal Palace. Some of these we would dismiss without further thought—especially the last. In our view there are two other alternatives which may offer a better solution. One is that, if part of the Fair must be continued in London, the allocation of trades be revised so that some sections that are related to the character of the exhibits for which Birmingham Section has now become thoroughly established, may be removed there. Wireless apparatus and the other things that interest the electrical, engineering and allied trades may be quoted as a typical class which would be more at home in the Midlands, and would enable some firms either to avoid dividing their displays or to be in their natural atmosphere and environment. Our other suggestion may be regarded as a sweeping one. There is abundance of site accommodation available at Birmingham. If new buildings have to be erected, why not there? Could not the whole undertaking be removed to this one centre?

Scientific and Industrial Research.

The annual report of the Department of Scientific and Industrial Research, which is abstracted elsewhere in this issue, contains much interesting reading. The Department has now been in existence for ten years, and the work accomplished during that period is reviewed by the Advisory Council, with pardonable self-satisfaction; it is held that we are witnessing to-day an "industrial revolution" fully comparable with that which followed the Napoleonic wars—"a revolution from haphazard empirical methods to those of scientific control and direction. Our industrial research policy must be directed to help British industry to make this inevitable change." It is gratifying to learn that the Council observes many signs of a change in the attitude of manufacturers towards research; many industrial firms are rapidly developing their scientific organisations, and establishing large research laboratories where funds permit—but still it is urged that the value of a continuous policy of research and scientific development is not yet fully realised. The country must learn that progress can be more efficiently secured by scientific methods than by the costly process of trial and error.

Much of the work of the Department is described as "helping industry to help itself"; this, we believe, was the original purpose of the "Million Fund," which was placed at the disposal of the Department exactly ten years ago. The intention of the Government, as expressed by Lord Crewe (Electrical Review, December 8th, 1916, p. 641), was to devote to the work "a very large sum, estimated to cover the needs of the next five years, on a scale which would enable them to spend four or five times as much on industrial research alone as the whole scheme had previously received." "Besides the lump sum above-mentioned, an annual vote would be provided to cover the expenses of the Department, to assist researchers and societies that were carrying out researches, and non-remunerative research."

That the Department has exercised strict frugality in releasing its hoarded funds will be realised when we state that the balance of the Million Fund at March 31st, 1926, was £429,984; its average annual outlay from this trust fund has therefore been about £64,000—less than one-third of the rate anticipated in 1917—and the Fund which was expected to cover five years' needs has

already lasted for nine and is still going strong. In view of the declared importance of stimulating industrial research and the urgent need of funds for that purpose, we think the Department might well adopt a more liberal attitude towards research associations of proved efficiency. It is true that according to the Advisory Council the electrical industry is in a particularly healthy position with regard to research in general, but for this it owes little to the Department, which proposes to withdraw its financial support from the Electrical Research Association after September, 1930, although the operations of that admirable Association are hampered by lack of funds. As regards the support of "pure scientific research," which is the father and mother of all industrial progress, the Department is lavish of protests of its kindly feelings towards it, but apparently limits its financial aid in general to those "pure" researches which have a direct relation to industrial research and a "practical aim"—a distinction from "industrial research" without a material difference.

Registered Contractors.

FURTHER progress was reported at this week's annual meeting of the Board of the National Register of Electrical Installation Contractors. Apart from the routine business, discussion centred around two points—wiring rules and the "small" man. With regard to the former, it was stated, unofficially, that the E.C.A. had adopted an abbreviated set of rules. This, no doubt, had reference to the abridged version which the I.E.E. Wiring Rules Committee commissioned the E.C.A. and the Association of Supervising Electrical Engineers (*née* N.A.S.E.) to produce jointly. Col. Crompton gave it as his opinion that the I.E.E. Rules, as they stood at present, were far too complicated for the ordinary contractor, and therefore could not be enforced by any body; they were, however, useful as recommendations and might possibly be considered as such eventually. Several members drew attention to the danger that compulsory regulations would seriously deplete the Register, but Mr. Cash was not unduly perturbed at that. He thought that such a "purge" would probably be all to the good of the better contractors, who would be able to stand increased registration charges.

Dealing with the question of the "small" man without proper, separate, business premises, Mr. Cross (Newcastle) thought that the Executive was not strict enough in its requirements regarding business qualifications. Mr. Purse, however, pointed out that the "small" man was not necessarily a bad contractor. This is certainly true if such men do not over-reach themselves, and in endeavouring to do too much pay too little attention to the quality of their work. Mr. Purse was ready with a remedy for this, stating that the cancellation of registration was a far more effective check than non-registration.

As opposed to this view of the small man, Mr. Shaw (Manchester) drew attention to the fact that many big firms had not become registered. The Committee was thus asked to attend to both ends of the contracting scale: to exercise extra discretion in registering small men, and to exert pressure upon the large firms to join and add to the prestige of the scheme.

London's Electricity Supply.

FOR the last time, the London County Council has issued its useful report on electricity supply in the London area, which, commencing with the County alone in 1901, has increased in scope until, since 1919, it has covered the whole of the London and Home Counties Electricity District, embracing a population of over eight millions. The extraordinary complexity of the electricity supply situation in that area of 1,797 square miles is well illustrated by the coloured map which accompanies the report; although there are considerable portions of the area in the north-east and south which, thinly populated, have no supply of electricity, there are no fewer than 89 authorised distributors in the District. Nowhere else in the world can there be found a "crazy patchwork" such as this, the product of misguided legislation, which deliberately aimed at segregation and decentralisation—the antithesis of modern views and of the course of natural development.

We abstract the report elsewhere in this issue, and will comment on it later; but we take this opportunity of complimenting the London County Council upon the good service which it has rendered to the public by the compilation of these excellent reports, for which it deserves the hearty thanks of the electricity supply industry.

The Central Electricity Board.

Elliott & Fry] [*London.*

Seated left to right:—**Sir James Devonshire, K.B.E., Sir Duncan Watson, Lt.-Col. The Hon. Vernon Willey, Sir Andrew Duncan (chairman), J. R. Brooke, C.B. (Secretary), Frank Hodges.**

Standing:—**W. K. Whigham, Sir James Lithgow, Bart., Alderman W. Walker, M.I.E.E.**

Electricity Supply at Ealing.

Abandoning the generation of electricity in favour of a bulk supply has modernised the system, involving the change-over of some 14,000 consumers' installations within three years of commencing to build the large new bulk-supply distributing station in Pope's Lane.

IN order to modernise its electricity undertaking in conformity with the Electricity Commission's ruling, the Ealing Corporation decided to scrap its old steam-driven a.c., 40-cycle generating plant and has built in its stead a large bulk-supply distributing station in Pope's Lane.

In the new transformer-station buildings (fig. 1) accommodation is provided for the technical staff, and

Fig. 1.—New Bulk Supply Distributing Station at Ealing.

extensive workshops, meter test room, &c., and storage room for apparatus which is to be hired out to consumers, power to do so having been exercised some years ago, but remaining in abeyance during the war period. Special attention has been devoted to ventilation, which is assisted by electric fans, and lighting and heating are electric throughout: all the water for the lavatories and various mess rooms is heated electrically also, different makes of apparatus having been installed for comparative purposes. That portion of the buildings in which the electrical plant is housed has been made fireproof; the roof is formed of concrete slabs in steel framework, covered with slate, and all metal throughout the buildings has been thoroughly earthed; scrap 0.25 sq. in. copper cable has been utilised for this purpose, carried down to the water-bearing stratum and coiled therein to form numerous "earth plates."

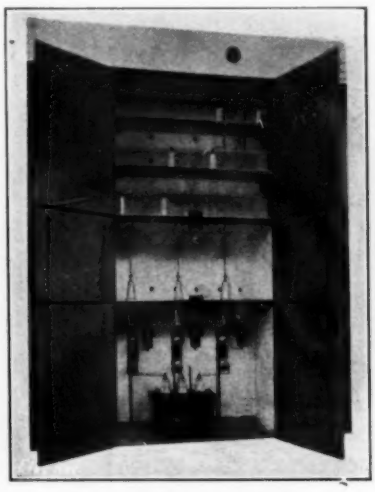


Fig. 2.—E.H.P. Bus-bar Cubicle.

The cost of the scheme has been enhanced somewhat by the fact that the Electricity Commissioners fixed the location of the 6-acre site of the new station in close proximity to one of the main cable routes of the Metropolitan Electric Supply Co., Ltd., from which the Corporation purchases 50-cycle, 3-phase electricity in bulk at 20,500 volts. It is instructive, too, to note that had the Commissioners maintained their original intention of specifying 3-phase distribution, the cost of the scheme would have exceeded £500,000, whereas considerable economy has resulted from the adoption of the arrangement outlined diagrammatically in fig. 4, which enables single-phase distribution to be carried out from "A" and "B" phases. Cost has also been influenced by the following facts:—The Metropolitan Co., in virtue of its statutory powers, has a right (which it declines to modify) of varying its pressure 12.5 per cent. above the declared voltage, whereas the Corporation is bound not to exceed a voltage variation of 4 per cent., and consequently it became necessary to provide booster regulating transformers, which have cost very nearly as much as the main transformers.

The Metropolitan Co.'s portion of the e.h.p. switchgear (supplied by the British Thomson-Houston Co., Ltd.) controls the bulk supply for the Ealing district as obtained either from Ironbridge (Hanwell) or Acton. It is designed to withstand a working voltage of 53 kV, as this increase of voltage is contemplated by the Metropolitan Co. at a later date. The e.h.v. apparatus is accommodated in separate cubicles, which are subdivided into the requisite number of compartments to ensure fireproofness. The cubicles are constructed of moulded-stone slabs and are divided vertically, the oil circuit-breakers and main isolators being assembled on one side of the partition, with the busbars and the remainder of the apparatus on the other side (fig. 2) and the sheet-steel doors are locked by "Castell" locks that have a different change number for each equipment: this method of locking is relied upon in lieu of any definite mechanical interlock.

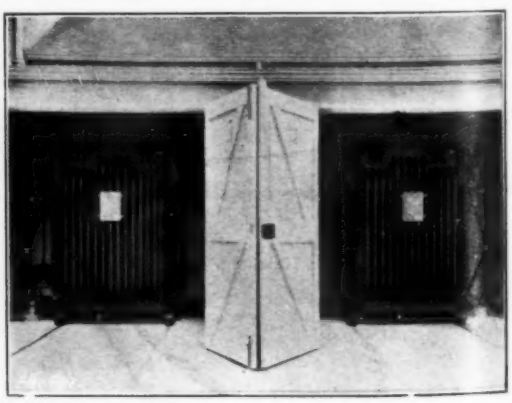


Fig. 3.—Main 20,500-volt Transformers.

An important feature is the lay-out of the metering

equipment. The busbar current transformers are located in the bottom cell of the cubicle on the breaker side; each transformer is connected in series with its respective busbar, a single-pole isolator being placed on each side of it to afford complete isolation. To maintain continuity of supply to the consumers' equipment during such isolation, each transformer can be short-circuited by another isolator.

Each 20-kV control panel is totally enclosed in a steel surround (fig. 5): the oil-immersed circuit-breakers are of the OMI/A1 type and have a normal rating of 300 amperes at 33 kV. The Merz-Beard protective system has been applied to both ends of these feeders.

The main transformers, fig. 3 (made by the British Electric Transformer Co., Ltd., as well as the boosters) are housed in separate brick cubicles outside the main station buildings. Twelve 750-kVA, single-phase, 20,500/2,600-volt transformers are being Scott-connected to form eventually six 1,500-kVA banks, giving a 2-phase, 4-wire supply at 2,600 volts; each phase passes through a regulating transformer to a 2-phase, 4-wire switchboard (fig. 8).

The present equipment consists of four complete sets of transformers of 1,500 kVA capacity each; the two limbs of each set are in separate oil-tight tanks, and constitute interchangeable limbs for Scott working. They are equipped, in addition, with externally-operated tapping switches on the e.h.p. side to compensate for 2½, 5, 7½ and 10 per cent. increase of the primary voltage, the secondary pressure meanwhile being kept constant at 2,400 volts.

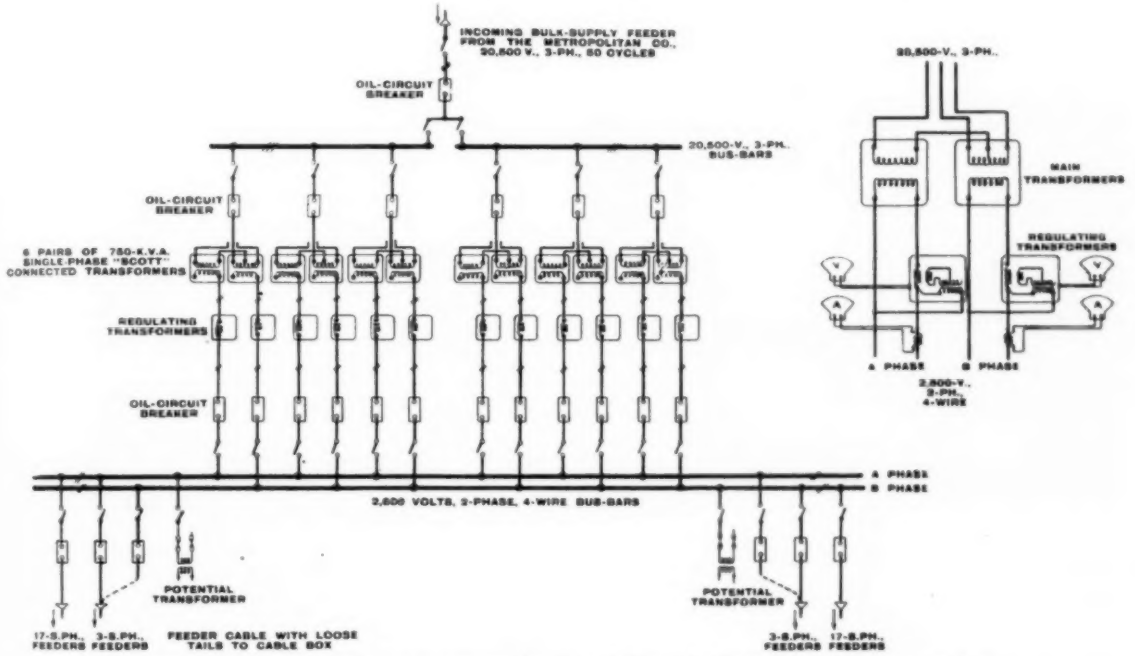
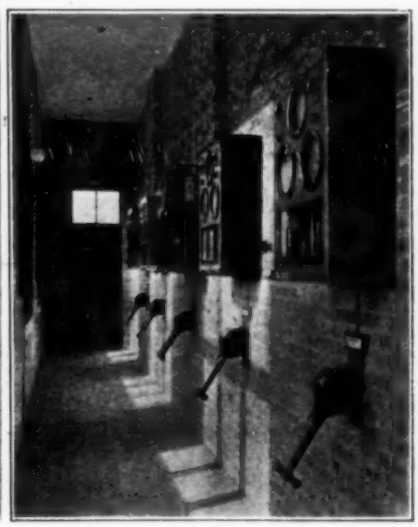


Fig. 4.—Diagrammatic Outline of Transformer Connection Scheme: 3-phase incoming, single-phase outgoing.

The single-phase regulating transformers (fig. 8) are equipped with hand-operated regulating switches and capable of giving a plus or minus 12½ per cent. boost to the line in ten 1¼ per cent. steps either way. All the transformers are of the Berry radial pattern, oil-immersed and self cooled.

The main transformers have braced windings to withstand possible short-circuit stresses, and the end turns are reinforced to withstand line surges; the main insulation consists of Bakelite Micarta cylinders between the winding, and the disposition of the coils is such that cooling oil is in actual contact with every turn. Each boosting transformer consists of two limbs mounted one on top of the other in the same tank, the boosting volt-

Fig. 5.—E.H.P. Feeder Control Panels.



Figs. 6 and 7.—Control Gear and 20,000-Volt Switch Cubicles.

age in the main feeder being controlled both in magnitude and polarity by means of regulating switchgear attached to the tanks.

The guaranteed efficiencies for the entire transforming plant are 98.25 per cent. on full load, 98.4 per cent. on three quarters and half load, and 97.8 per cent. on one quarter load.

The Corporation's switchgear installation, which formed the main part of the contract, was carried out by the English Electric Co., Ltd. It includes the main incoming supply feeder and 6 complete 3-phase transformer equipments, all for 20,500 volts: also 60 sets of single-phase equipment, as follows:—12 trans-

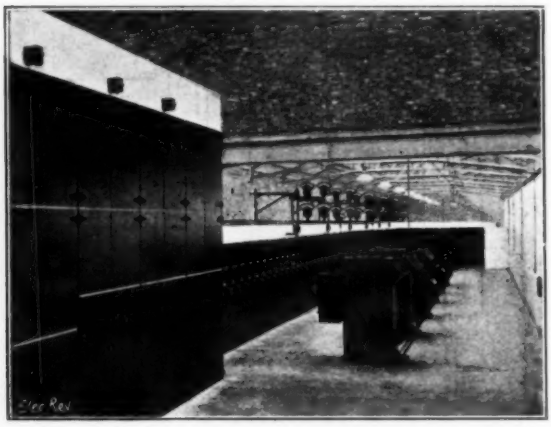


Fig. 8.—General View of Station Interior.

former control equipments; 17 feeder equipments on phase "A" and 17 on phase "B"; 6 feeders, each with 2 switching equipments for connection to either phase "A" or "B"; 2 potential transformer metering equipments, one on each phase. The general scheme of connections (fig. 4) shows that the 3-phase, 3-wire, 50-cycle incoming supply feeds through an oil-immersed circuit-breaker equipment on to the two halves of a single set of 20,500-volt, 3-phase busbars, sectionalised by means of a double set of isolating switches in the incoming feeder equipment, so that at times of light load one half of the bars can be made dead for inspection, &c., whilst the supply is maintained through the other half. In addition, there are six swinging brackets, each carrying a set of paralleling and load-regulating ammeters and voltmeters, one set for each transformer group. The method of connecting these voltmeters is somewhat novel (fig. 4 inset), the connections having been taken from tappings on the shunt windings of their associated regulating transformers to enable a considerable saving to be effected in potential transformers.

Both the high- and low-voltage switchgear is contained in stone cellwork cubicles. The 20,500-volt oil circuit breakers are manually operated, the control portion being divided by a brick wall from the cellwork, as shown in figs. 6 and 7: the former shows the control handles mounted on the brick wall with the instruments in sheet-metal cases above; the latter shows the back of this wall, the operating rods, and cellwork.

These breakers are of class O.K.B., size O (600-ampere), with a rated rupturing capacity of 350,000 kVA (at 25,000 V). Three single-pole switches are united by means of Oldham couplings, and the phases are separated throughout by stonework barriers, the opposite side of the 20,500-volt cubicles being visible in the foreground of fig. 8, which is a general view of the interior of the station, showing the 60 single-phase equipments along the far end, and some of the regulating transformers can be seen along the centre; the main transformers are outside the right-hand separating wall of the building. All the 2,600-volt single-phase feeder equipments are also housed in stone cellwork with barriers between phases; a closer view of this gear is fig. 9, which shows the equipments for the two phases and one of the transformer banks. It will be noted that the isolating switches in the upper compartments are operated by a removable handle, padlocked covers over the handle openings preventing unauthorised operation. Each single-phase equipment is controlled through two single-phase oil circuit breakers coupled together: the couplers' carrying capacity is 800 A, each with a breaking capacity of 150,000 kVA (at 6,600 V), whilst the feeder switches' carrying capacity is 400 A each, with a breaking capacity of 75,000 kVA (at 6,600 V).

The breakers are of the spring-tank type, the patented feature of which design is that the oil in the tank reaches the level of the bottom of the top frame, which projects inside the tank, the latter being suspended on springs combined with the tank bolts to allow the necessary cushioning action on opening circuit. The absence of an air cushion is claimed to prevent the formation of an explosive mixture within the tank, any gases formed on opening being allowed to leak out around the sides of the top where it projects into the tank.

A simple system of overload and leakage protection has been applied on the 20,500-volt side, with reverse-power protection on the transformer equipments on the 2,600-volt side; simple overload protection is provided for the single-phase outgoing feeders. Cables inside the station were supplied by Messrs. Siemens Brothers and Co., Ltd., and all outside cabling is being carried out by the Corporation's staff.

In conclusion, it may be recorded that £200,000 has already been sanctioned for the conversion scheme. It was unfortunate that the scheme was initiated prior to the Electricity (Supply) Bill, 1926, becoming an Act of Parliament, for the Corporation thereby became ineligible for financial assistance from the State electricity authorities.

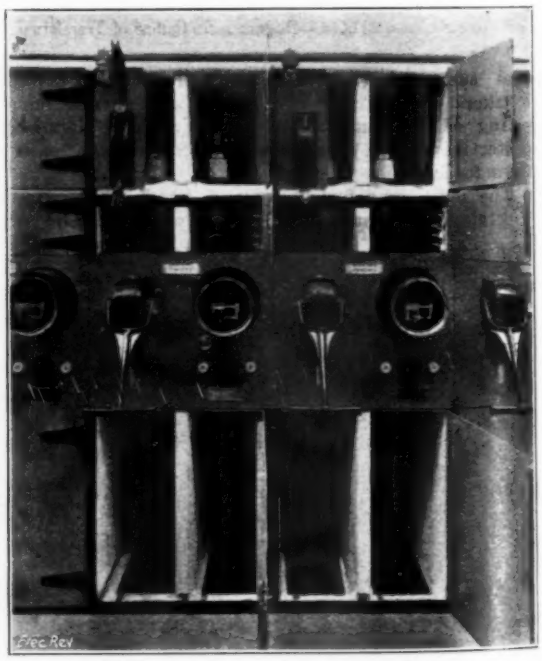


Fig. 9.—Single-phase, 2,600-V Feeder Equipment.

Finally, it is a pleasure to express our indebtedness to Mr. J. Douglas Knight, chief electrical engineer to the Ealing Corporation, who has been solely responsible for carrying out the scheme, for permitting his new station to be inspected and described, and to the manufacturers concerned for the photographs of the plant reproduced above.

A noteworthy feature is Mr. Knight's expressed appreciation of the manner in which the main contractors, the English Electric Co., Ltd., carried out the work, and the spirit of co-operation shown both with him and with the sub-contractors.

Canadian and United States Electrical Trade.

Customer and Competitor.

IN the ELECTRICAL REVIEW of January 21st an article was published showing the trend of the electrical trade in some of our chief oversea markets. In the succeeding issue a review of Great Britain's imports and exports of electrical goods during 1925 and 1926 was given. Both these articles were illustrated by graphs. It is now proposed to survey the electrical trade of Canada and the United States. The former cannot be considered as one of our chief markets,

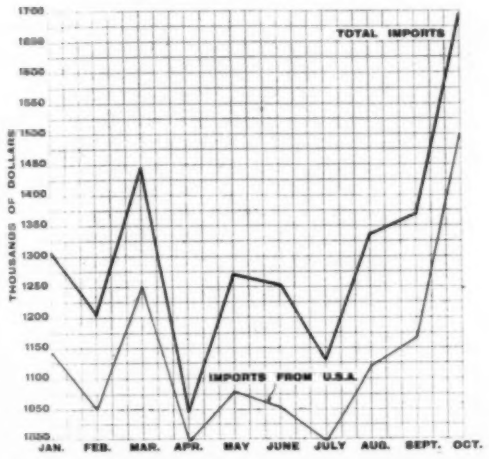


Fig. 1.—Canadian Electrical Imports, 1926.

although, as will be seen later, there are in certain directions better prospects than may generally be supposed. In some classes, *e.g.*, domestic appliances and ignition apparatus, Canada seems likely, however, to rival Great Britain. As to the United States, she stands as a strong competitor. The present article includes curves showing the course of Canada's electrical import and export trade in aggregate and in the classes of goods of outstanding interest to this country, and also the course of United States exports.

The upward curve of imports of electrical apparatus

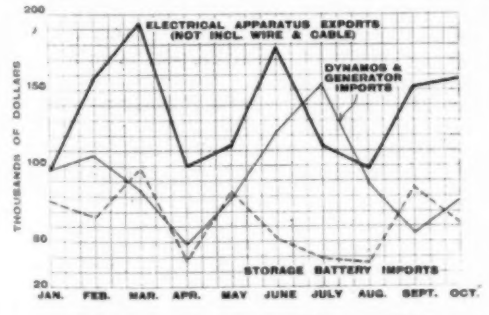

ELECTRICAL APPARATUS EXPORTS (NOT INCL. WIRE & CABLE)
DYNAMOS & GENERATOR IMPORTS
STORAGE BATTERY IMPORTS
THOUSANDS OF DOLLARS
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT.

Fig. 2.—Canadian Imports and Exports, 1926.

into Canada should inspire British manufacturers with fresh efforts to capture a larger share of this trade, most of which, it will be seen, goes to the United States. One serious disability under which our makers still suffer is the long prevailing practice of submitting most of the electrical equipment intended for use in the Dominion to the tests of the Chicago Underwriters' Laboratories. But the concern which is virtually the largest buyer of electrical plant in Canada, *viz.*, the Ontario Hydro-Electric Power Commission, has power to pass equipment, and in this circumstance British firms have good prospects of consideration. This subject has been discussed again and again in these pages, and we refrain from further comment in this article as we shall be dealing somewhat fully with the latest developments in the situation in our next issue.

Mr. F. W. Field, H.M. Trade Commissioner in Canada, mentions in his report that hydro-electric developments offer an outlet for a fair amount of machinery and supplies of British manufacture. The

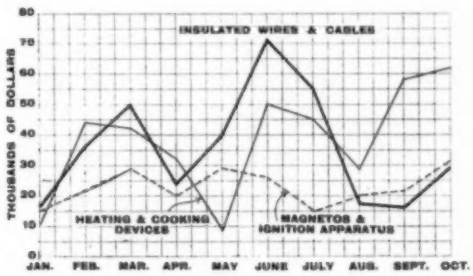

INSULATED WIRES & CABLES
HEATING & COOKING DEVICES
MAGNETOS & IGNITION APPARATUS
THOUSANDS OF DOLLARS
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT.

Fig. 3. Canadian Electrical Exports, 1926.

waterwheel type of a.c. generators, he says, represents the principal demand in electrical rotating machinery. Some units up to 6,000 kVA are of the horizontal type, but most of the machines from 500 kW to 50,000 kW are of the vertical type. These alternators are mostly in two frequencies, namely, 25 cycles or 60 cycles. They are all three-phase, and the standard voltages are 2,400, 6,600 and 13,200. With regard to transformers, the Trade Commissioner says that there is a good demand for various sizes from 1 kVA to 20,000 kVA, mostly single-phase. The large transformers are of the oil-immersed, water-cooled type, and the small transformers are mostly oil-immersed, self-cooled. The frequencies are 60 cycles and 25 cycles, and the standard voltages range from 2,200 to 220,000. In transformers for voltages up to 66,000, the competition from local manufacturers is very keen, and there appears to be little reasonable chance of making a profit under pre-

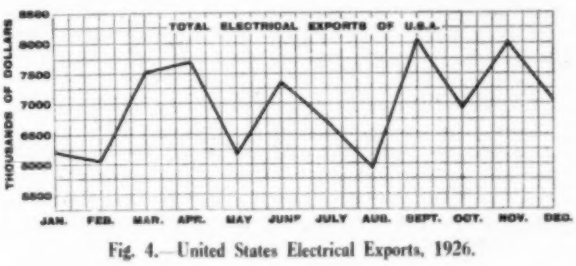


Fig. 4.—United States Electrical Exports, 1926.

sent conditions. The City of Winnipeg recently received tenders for 5,000 kVA 60-cycle transformers, including freight, duty, sales tax and oil in accordance with very strict specifications and conditions at a price less than $2 per kVA.

On the subject of motors, Mr. Field points out that most of those purchased are of the squirrel-cage

induction type for frequencies of 25 and 60 cycles. They are all three-phase, and the standard voltage is 550. Larger motors are supplied when desired for 2,200 V. A number of the pulp mills use self-starting synchronous motors of about 2,500 h.p. at 225 r.p.m. There is also a moderate demand for synchronous motors in other industrial plants. For d.c. motors, the demand is limited. Tramway equipments are purchased from time to time by the various street railway systems.

Finally, the Trade Commissioner remarks that as most of the power development is hydro-electric, the demand for steam turbine generating plants is limited. A few plants are in operation in the prairie provinces where little or no water power is available. In this section, however, the population is relatively small, and until water powers throughout Canada, within commercial distances, are developed to their capacities, there will not be a great demand for steam-generating plants.

From the charts relating to Canadian import and export trade in electrical apparatus (figs. 1, 2 and 3),

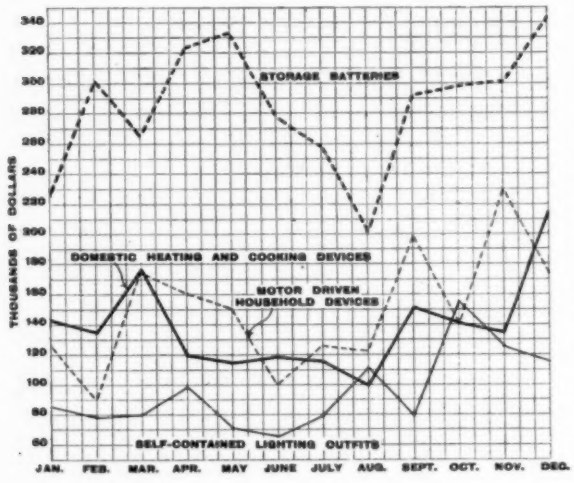

STORAGE BATTERIES
DOMESTIC HEATING AND COOKING DEVICES
MOTOR DRIVEN HOUSEHOLD DEVICES
SELF-CONTAINED LIGHTING OUTFITS
THOUSANDS OF DOLLARS
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

Fig. 5.—United States Electrical Exports, 1926.

it will be seen that the value of the imports of dynamos and generators in some months has not been far removed from the total value of the exports of electrical apparatus as a whole. Among imports, storage batteries are an important item, while on the export side, heating and cooking devices and ignition apparatus loom large.

The statistics of American exports of electrical machinery and apparatus for last year (fig. 4) show an increase of 14 per cent. in the total as compared with 1925. The detailed figures for the two years were published in our issue of March 18th (p. 447), and the list shows many notable increases; at the same time there were several large falls. So far as the classes shown in fig. 5 were concerned, there were rises in the exports of storage batteries, motor-driven household devices, domestic heating and cooking devices, self-contained lighting outfits and stationary motors (1 to 200 h.p.). In the cases of radio apparatus, a.c. generators (2,000 kVA and over) and ignition apparatus (fig. 6), there were decreases.

In view of the great progress made by British manufacturers in recent years in the design and execution of switchgear, notably for high voltages, it is interesting to examine the records of American exports of this class, and to compare them, as far as possible, with those of British exports. The United States figures are as follows:—

United States Exports.

	1924.	1925.	1926.
	£	£	£
Switchboard panels, except telephone	432,000	461,000	438,600
Switches and circuit breakers over 10 amps.	450,000	485,000	523,600
Total ...	£882,000	£946,000	£962,200

Although no statistics of British exports of control and switchgear in 1926 are yet available, owing to lack of detail in the classification adopted in the monthly returns, a striking advance is shown between 1923 and 1925, as will be seen below:—

Great Britain's Exports.

	1923.	1924.	1925.
	£	£	£
Switchboards, other than telegraph and telephone	103,000	91,000	88,010
Control and switchgear	522,000	945,000	1,360,000
Total ...	£625,000	£1,036,000	£1,448,000

It is reasonable to assume, in view of the large increase in the total exports of electrical goods generally in 1926 (see page 150 of our issue of January 28th), that there was a further increase in those of control and switchgear also in that year.

The total sales of apparatus and accessories produced by the American radio industry last year amounted in value to about 500 million dollars (say 100 million pounds), an increase, as compared with the previous year, of over one hundred million dollars, or 20 million pounds, although exports were lower. Business at Christmas was reported to be extraordinarily favourable, partly on account of the introduction of new and improved models and partly owing to the spread of broadcasting generally. The development of the American radio industry has been relatively more rapid than that of motor-car manufacture. As in the latter industry, the demand for the necessary raw materials has created unusual activity in a number of other branches of manufacture. For example, there has been a substantial increase in the demand for both hard and soft wood for making the boxes for the apparatus and the packing cases for their dispatch. Competition is very keen among manufacturers, whose

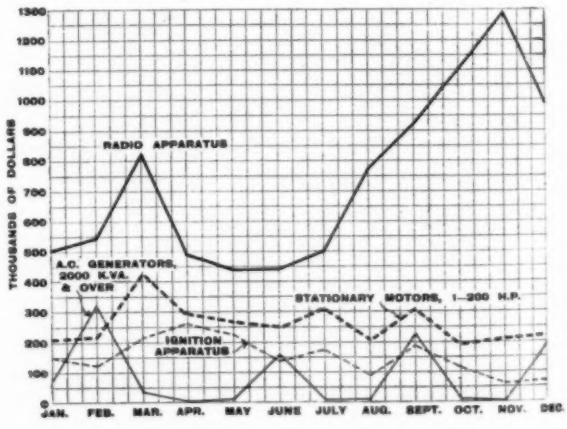

RADIO APPARATUS
A.C. GENERATORS, 2000 K.VA. & OVER
STATIONARY MOTORS, 1–200 H.P.
IGNITION APPARATUS
THOUSANDS OF DOLLARS
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

Fig. 6.—United States Electrical Exports, 1926.

profits are limited by the circumstance that the retailers often make 30 to 40 per cent. on certain kinds of apparatus and accessories.

A recent issue of *Commerce Reports* contained preliminary statistics of United States electrical exports during January. The total value is given as $7,711,883, as compared with $7,146,977 in January, 1926. Generally speaking, the increase was due to larger shipments of the lighter electrical equipment: in the heavier classes, such as generators, transformers, motors and transmission and distribution apparatus, there was a decline. The highest individual rise occurred in the case of storage batteries, from $226,363 to $346,520. The radio apparatus group recorded a rise from $499,699 to $611,660. Electric lamp exports also showed a large gain. The greatest decrease was in the item "switchboard panels, except telephones," which fell from $511,687 to $84,643. Other large decreases occurred in the cases of stationary motors, motor accessories and parts, electric locomotives, instruments and domestic heating and cooking devices.

Metal Patterns and Electricity.

Recent improvements in metal pattern-making indicate that the use of electro-deposition and electric heating is advantageous, leading to economy and greater accuracy.

By J. EDGAR.

DURING the last two or three years the art of patternmaking has advanced considerably, and it is generally agreed that for repetition work, metal patterns have advantages over the wooden variety.

Electricity's part in the construction and use of metal patterns is that they are now sometimes made by electro-deposition, and that they are heated by electricity before being used. By electro-deposition, metal patterns are made very accurately, owing to the fact that there is no shrinkage involved: since such patterns are exact duplicates of the original in size, shape, and finish, it is obvious that machining, filing, and scraping operations are practically all eliminated. Patterns can be made of copper, brass, nickel, or any other metal, or combinations of metals (for example, a nickel surface with a copper backing).

The method of procedure is similar to that used in electro-typing. Casts of wax, plaster of paris, or any fusible alloy are taken of the desired pattern to be reproduced; the casts are made with a conductive material on the impression surfaces (in the case of wax, or plaster of paris, graphite is used to make the conductive surface) and contact wires are inserted in the casts to make connections in the plating tank and to the conductive surface of the cast. Suitable insulation is provided to prevent the metal from spreading on to the non-conductive surfaces; the casts are then placed in the appropriate plating solutions, and allowed to remain therein until the desired thickness is obtained. The casts are afterwards taken from the bath and the metal deposits removed, and backed up by some suitable alloy, such as white metal, to give strength, if necessary. The partings are then checked very closely and machined or ground off, if required, from which point onwards the procedure is identical with the old method.

The deposition process can be used for making split patterns mounted on both sides of a plate, split patterns mounted on cope and drag plates, split patterns mounted on one side of a plate, cope, and drag plates when the patterns and plate are cast integrally. Where cast-aluminium match plates are used, cope and drag plates can be very easily substituted by this method. Patterns to be gated can be made in halves and sweated together. This process includes core boxes.

When moist moulding sand is rammed up around a cold metal pattern, a thin film of moisture collects on the surface of the pattern, so that when it is withdrawn from the mould there is a tendency for some of the sand to adhere to it; this causes a roughening of the surface of the mould, so that it will not yield a clean smooth casting. For many classes of work it is essential that the castings be clean and smooth, and therefore means must be used to overcome the tendency of the sand to stick to the pattern. There are two ways of preventing this trouble: one is to dust a parting compound over the pattern, and the other is to heat the pattern.

If a parting compound is used, it must be applied frequently, at least for every second or third mould, which takes a certain amount of time; furthermore, it may be done carelessly, with the result that parts of the mould may not be covered, in which case imperfect moulds will result. Imperfect covering of the mould would be especially likely to happen in the case of intricate patterns, or patterns with surfaces nearly perpendicular to the plane of the mould, to which surfaces the compound might not readily adhere. Proper heating of the pattern, however, ensures that all parts are equally prepared to prevent the sticking of particles of sand, and eliminates the time required for applying the compound.

The gas flame and paraffin torch are frequently used for heating patterns, but electricity has been successfully used, and it is rather surprising that it has not been developed and employed more generally. Some years ago one large foundry adopted the following method: a steel-clad type of heater was used, and the electricity was obtained from an ordinary lamp socket through a flexible cord which was attached to the pattern carriage. In moderately cold weather the heat was used intermittently as the need for it arose, but in extremely cold weather the heat was applied continuously while the pattern was in use. The capacity of the heaters was 600 watts at 110 volts, and the temperature to which the patterns were heated was approximately from 32 to 37 deg. C.

Standard steel-clad heaters of the narrow type, which was in the form of a long flat strip, approximately 20 in. long, $1\frac{1}{8}$ in. wide, and $\frac{1}{2}$ in. thick, were laid in grooves cut in the face of a cast-iron plate which formed the top of the carriage. The heater terminals projected downward through holes drilled through this plate, and were wired to a plug socket on the side of the carriage. The upper surfaces of the heaters were perfectly flat and flush with the upper surface of the plate, so that when the pattern plate was laid on the top of the carriage, the heaters were in contact with it. With the pattern plate in place and fastened with suitable bolts and screws, the assembly was similar to the construction of a modern electric iron—the heating elements being firmly clamped between two metal plates so that the heat of the elements would be transmitted by conduction to the working surface. This enabled the heaters to operate at a relatively low temperature, and made the surface of the pattern quickly responsive to the application of the heat.

Some of the pattern carriages were equipped with electric heaters mounted in the space below the pattern plate, but not in contact with it, so that the heat was transmitted to the plate by radiation instead of conduction. This method was not so efficient in the utilisation of the heat, and resulted in a slightly greater power consumption and lower heating; but it was otherwise satisfactory. It is a cheaper method of installing the heaters, and in some cases it may be the most practical method.

The same type of electric heaters can be successfully used on a moulding machine. As in the case of the radiator patterns, the method of applying the heaters consists essentially in arranging and supporting them so that they will be in contact with the under side of the pattern plate below the thickest part of the pattern.

An Electric Welding Job.

Extensive repairs to the cast-iron casing of a generator which had been dropped and badly damaged.

By C. H. S. TUPHOLME.

AN interesting repair job has recently been carried out on the cast-iron casing of a 6,000-V generator which was inadvertently dropped from a height of 150 ft. whilst being transported across a river. The casing, which is ¾ in. thick, increasing to 2½ in. at the face where the end covers are bolted on, was broken and cracked in many places, as shown in fig. 1. To save the cost of a new housing, it was suggested that the generator might be repaired by electric welding, and this process was resorted to.

The welder found that the casing had sprung about 1/16 in. where it was cracked. He had all the cracks grooved out to a width of about 1 in. by ¼ in. deep, and then, utilising the bolt holes round the rim for fixing specially made clamps, pulled the casing back into its original position. The face of the groove on each side of the crack was spotted and built up until a V had been formed with the crack in the centre.

When the metal had cooled, the fractures were connected up with short runs, the whole job being completed without a single crack appearing in the welding. The clamps were then removed and the crack was welded up where it continued down the face of the rim. All the fractures were similarly treated, many broken pieces of the bottom of the casing having to be first fitted into position.

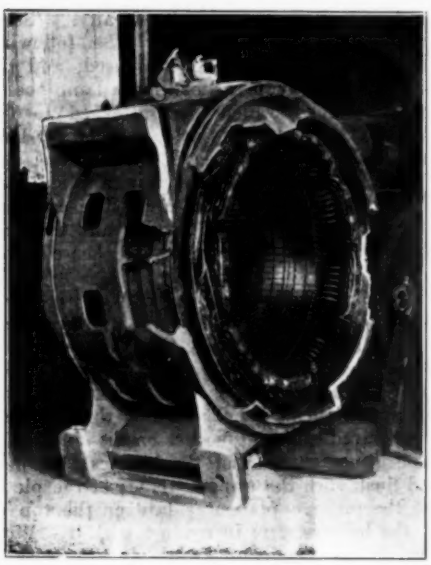


Fig. 1.—Damaged Generator.

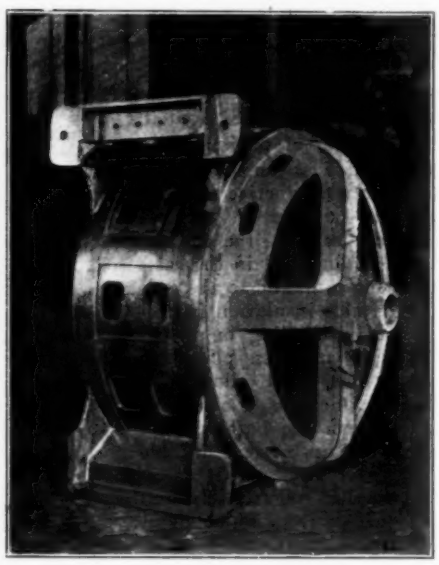


Fig. 2.—Repaired Machine.

Two of the feet had been broken off, and a large piece of the casting between them had fallen in the river and was lost. This repair was carried out by studding a piece of angle-iron, 6 in. by 6 in. by 1 in., to the casing, between the feet, and then welding it up. It was then studded to the legs and the whole welded together.

The job took 7½ days to complete and resulted in a thoroughly successful repair. Electric arc welding was adopted, and Quasi-arc electrodes, 360 ft. of No. 10 and 575 ft. of No. 12 cast-iron, and 300 ft. of No. 10 and 150 ft. of No. 12 mild-steel were used. The completed job is shown in fig. 2, and the generator has been in successful operation ever since the repairs were effected.

Hand-Operated or Automatic?

A consideration of the three principal types of motor control equipment with regard to the duties which they are required to perform.

By ROBERT MARSDEN, M.M.A.E.

THIS is a question with which every prospective purchaser of electrical equipment is confronted. No doubt the cost of automatic control gear prevents many from considering the countless advantages which it possesses if correctly applied.

Switchgear can be divided into three distinct classes:—1. Hand-operated; 2. Semi-automatic; and 3. Fully-automatic.

In the first class comes the simple starter familiar to most people, and generally fitted with a "hold-on" coil which allows the handle to return to the "off" position if the supply fails. Drum controllers are another form of the simple starter, but are arranged for hard wear and heavy duty. Between these two, on the direct-current side, comes the heavy-duty type, which is an ordinary starter built on more robust lines and generally incorporating a magnetic blow-out coil over the first starting contacts, with carbon tips to take any sparking that may arise during operation. Where "inching" is necessary, it is always advisable on either a heavy-duty type or drum controller of over 3 h.p. capacity to have a single-pole contactor to make and break the circuit; otherwise the ordinary contacts will soon be burnt and cause endless trouble. The plain starter is too well known to need its duty defining. If the motor is required to start against a heavy load, always use a heavy-duty type starter. For instance, in starting up a machine with a heavy flywheel, like a compressor or guillotine, the weighty flywheel will not speed up in about 7-10 seconds, which is the rating for ordinary starters of the smaller sizes. If one of these is used, the resistance will never stand the abnormal heating for long.

On the alternating-current side, if a high-torque squirrel-cage motor cannot be used, then the same applies to the rotor resistance of a slip-ring motor equipment. Where frequent operation is required, and the drum controller can be conveniently mounted, this makes quite a good job and is the best that can be given without resorting to automatic control in some way.

This, then, leads to the semi-automatic type of switchgear, which is at the present time undoubtedly becoming the most popular. This gear is arranged so that, by means of push buttons or a master switch, the motor can be inched, started, and stopped. If any speed variation is required, this is set by a hand-operated regulator, and once set, the motor always runs up to that speed when the start button is pressed. This type of control is largely used in the driving of printing machinery, paper-making plant, lathes, con-

veyors, &c., and should be installed wherever continual quick starting and stopping is required.

The final class is the fully automatic control, which is self-explanatory. Everything is automatic and can be operated by the usual remote-control devices. Lifts, hoists, rotary newspaper and magazine presses, big planer equipments, pumps that have to maintain a constant supply, automatic pressure plants, &c., all call for this type of control. Wherever anything big has to be driven, automatic control is essential, so that a man can keep his eyes on the machine and not endanger either himself or the plant by concentrating upon starting up and setting the running speed by hand.

A growing feature in connection with automatically controlled equipments is the application of dynamic braking. This is achieved by putting a resistance across the armature of the motor after the current has been cut off, and as the inertia of the machine being driven tends to keep the armature revolving, a current is generated. The less the ohmic value of this resistance, the greater the flow of current; the armature being thereby heavily loaded, it quickly comes to rest. This electrical braking is very powerful, and care should be exercised when testing out a new equipment. The resistance should be arranged with three or four tappings, so that a correct adjustment can be made. As this braking is purely automatic, it will be appreciated how valuable it is in saving time by stopping in a few seconds a machine which might otherwise run on for some considerable time.

Another important feature, well worth incorporating with a machine controlled by push-buttons or a master-switch, is an ammeter. This is often regarded as an unnecessary expense, but not infrequently it has proved the very thing that has prevented disaster. The current consumption of a motor, as shown by the ammeter, is a positive indication of the behaviour of the machine that is being driven.

It should always be borne in mind that it is false economy to use any but the best makes of automatic control gear, as invariably this type of control is used in conjunction with expensive machinery working on an output basis, and, with gear of inferior quality, breakdowns are almost inevitable and will cause serious delays and resultant losses.

Electrical Power Engineers' Association.

Annual Dinner of Northern Division.

THE eighth annual dinner of the Northern Division of the Electrical Power Engineers' Association was held at the Midland Hotel, Manchester, on March 26th, under the chairmanship of Mr. T. Riley, Burnley.

After the loyal toast, Lt.-Col. Sir Joseph Nall, M.P., proposed "Success to the Association," which, he said, represented an industry that had shown vast expansion and of which the highest hopes were entertained. They had now reached a settled stage in legislation, and, working on sound lines, the E.P.E.A. was assured of success.

Mr. A. W. CROMPTON, president of the Association, responded. He regarded the co-operation between the staffs of electricity supply stations and the manufacturing concerns as of the utmost value, and was glad that their scheme for the training of engineers was completed.

Mr. R. R. TELFORD, vice-president, proposed "The Electricity Supply Industry," and suggested that the publicly owned stations had done much to help the development of the manufacturing side of the industry. The electricity supply industry had shown that it was possible to pay high wages and obtain good results. In Sheffield in 1913 coal was 6s. per ton and the wages of firemen 25s. per week, and it was cheaper to run an inefficient steam engine than to obtain power from the public supply authority. But now coal was 30s. and firemen had £3; and it was found cheaper and better to depend on electricity. The tramway authorities were dependent on the electrical industry to maintain the fight against other means of transport; and tramways gave electrical engineers a very desirable load at times when the industrial demand slackened.

Response was made by Ald. W. WALKER, M.I.E.E., member of the Central Electricity Board. He said that while other industries were depressed the electrical industry continued to prosper increasingly. Electricity had become fashionable among the women. Many undertakings were prospering because they had brought home to the housewife the advantages of electricity in the house and home.

Referring to the Central Electricity Board, Ald. Walker said it had not yet commenced to function. The members had just got to know each other. Parliament had been greatly concerned with electricity in 1919, 1922 and 1926; it should now leave electricity alone and let those in the industry get on with the job of producing energy for the community. Comparisons were frequently made with what had been done in other countries; but the conditions were often different, and were not comparable. The new Board would assist in the development of electricity supply and seek to give every part of the country which was ripe for the development a supply at a cost which would bring it within the economic possibilities of the industries within the area. It would not be possible to give an abundant supply to every district within a short number of years; but he believed it would be possible to bring about adequate supplies in many areas at an early date, and also an average reduction of price.

Professor B. MOUAT JONES, principal of the Manchester College of Technology, in proposing "The National and District Joint Boards," commended the scheme of training which had been devised, but doubted the value of new examinations where such tests were already provided.

Response was made by Mr. W. J. H. WOOD, borough electrical engineer, Bolton.

Mr. A. C. WRIGHT, chairman, Manchester Section, proposed "The Ladies and Guests," replies to which were made by Mrs. H. C. LAMB, wife of the Manchester Electricity Department's manager and engineer, and Ald. J. W. LONGLEY, Bradford.

Legal.

X-Rays, Ltd.

MR. JUSTICE TOMLIN, in the Chancery Division on March 22nd, sanctioned the reduction of the capital of X-Rays, Ltd., from £75,000 to £24,265 2s., by reducing the £1 preference shares to 5s. each and the ordinary shares to 6d. each.

Mr. MAY, who appeared for the company, said the petition was adjourned from last December. His Lordship then said that the preference shareholders, whose rights were altered by the petition, did not appear to have had the opportunity of voting on the resolution for confirming the reduction of capital. These meetings had now been held and were unanimously in favour of the reduction. The company was formed in 1908 for the manufacture of all kinds of electrical apparatus, especially in connection with X-rays.

Southern Counties Electric Light and Power Supply, Ltd.

IN the absence of any opposition, Mr. Justice Romer, in the Companies' Winding-up Court, on March 22nd, made an order for the compulsory liquidation of the affairs of the Southern Counties Electric Light and Power Supply, Ltd., on the petition of Mr. Percy Green and another, creditors.

Counsel for petitioners said the petition stood over so that the necessary affidavit verifying the petition could be sworn, but the gentleman who intended to do so had died. The affidavit had, however, been sworn by his representative.

His Lordship was informed that although the company did not oppose the petition, a director, the secretary, and the company's solicitor were actually in Court.

Wareham Electric Supply Co., Ltd.

THE affairs of the Wareham Electric Supply Co., Ltd., were again before Mr. Justice Romer, in the Companies' Winding-up Court, on March 22nd, on the petition of a shareholder, Mr. William E. Weston, of Hounslow, that the company should be wound up compulsorily.

Mr. WILFRED HUNT, for the company, said the petition was first before the Court on February 2nd, and it had been standing over to enable the company to file evidence in answer to the petitioner's very long affidavit. Mr. Hunt said there was a charge of fraud. In view of the complicated nature of the matter and the mass of documents involved there had not been time to answer the petitioner's affidavit, and he asked for a further adjournment for fourteen days.

Mr. GALBRAITH, K.C., said he appeared for Mr. Edwards, who was the voluntary liquidator until that was put an end to in 1923, since when he had had nothing to do with the matter. But it was a case where, he thought, witnesses would have to be cross-examined.

Mr. R. J. WILLIS, for the petitioner, said he was anxious to have a full investigation, and he wanted to see the company's affidavit. He had been very careful to put into the petition only such things as could be proved by documents.

His LORDSHIP, in granting the adjournment asked for, directed the attendance of witnesses for cross-examination if necessary, and said he hoped they would be able to dispose of the case at the next hearing.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Easter Holidays.

We wish to draw our readers' attention to an announcement appearing in our Advertisement Supplement, stating that the issue of the Electrical Review for Friday, April 15th (Good Friday) will be published on the morning of Thursday, April 14th. All editorial and other matter intended for that issue should be sent in earlier than usual. New copy and blocks for advertisements must be received at 4, Ludgate Hill, E.C.4, by the morning of Wednesday, April 6th, but "Official Notices" and "smalls" can be received up to 5 p.m. on Monday, April 11th.

The E.D.A.-E.L.M.A. Campaign.

Rapid progress has been made during the past week or two and, according to the last official report, on March 26th there were 122 circles; 105 demonstration houses had been run; nearly 4,000,000 pieces of literature had been circulated; 1,501,000 competition booklets had been disposed of; and about 85,000 ballot papers had been received. At the present rate it was anticipated that the number of papers received would reach 100,000 before the close of the competition. So great has been the interest created by the demonstration houses that it is fairly certain that they will continue right into the summer. Builders and furnishers have proved most anxious to co-operate in the displays. A great demand for booklets is coming from schools as a result of a special effort made in that direction. During last week demonstration houses were opened at Bermondsey, Whitley Bay, and Malton. In the case of the first-named the average daily attendance has been about 800. Houses were to be opened this week at Heaton (Newcastle), Saltburn, and West Hartlepool. The last-named is the second to be opened in the town; the other was the first of the campaign demonstration houses.

Sir Harry Hatt, chairman of Bath Electricity Committee, speaking at a dinner of the Bath Electric Circle on March 24th, said that he hoped to see electricity within the reach of everybody at reasonable rates. He did not think that that would have been possible without the powers granted by the Electricity Act. He did not think that the Corporation would do much wiring itself, but even if it did the contractors would get the appliance business. The successes of the undertaking and the contractors were bound up together.

On March 25th a dinner was held by the Exeter and District Electric Circle. Mr. W. Brock, proposing the chief toast, said that the Exeter Electricity Committee, of which he was a member, was desirous of doing everything possible to assist the contractors and all in the electrical business. Although it was often urged that the Committee should do more advertising for business, the view taken was that this should be left to the contractors themselves. The Corporation had always laid down firmly the rule that it would do no trading. The chairman (Mr. H. D. Munro, city electrical engineer) said that the Circle's area extended from Dawlish to Exeter. There were great things ahead in the electrical world, and with the problems that would have to be solved in the near future, it was as well that electricians should discuss matters among themselves. Mr. L. G. Holt, responding to the toast of "The Manufacturers," visualised Exeter as a super station of the South or South-West. He stated that more persons entered the all-electric house in Exeter, promoted by the Circle, than in any town in the country.

The North-East Coast Area Circle recently organised a slogan competition for children. In view of the difficulty of judging, it was decided by the committee to divide the prize money into four prizes of £2 and six of 10s. After the slogans had been judged, it was discovered that the son and daughter of Mr. J. H. Parker, borough electrical engineer of West Hartlepool, had been awarded prizes. When acquainted with this fact they declined to accept the prizes, and requested that the money should be divided among the other four winners, making their prizes 15s. The slogans showed great merit.

An all-electric house arranged by the Southern East Anglia Circle was opened at Ipswich on March 19th. Every room of this dwelling is electrically equipped in a very thorough manner, the furnishing and decoration having been carried out by a local firm. At night the building is floodlighted. The members of the local Circle are the Corporation Electricity Department, the East Anglian Electric Supply Co., Ltd., Colchester Corporation, Bury St. Edmunds Corporation, the Orford Electric Light & Power Co., Ltd., the General Electric Co., Ltd., Callender's Cable and Construction Co., Ltd., Metro-Vick Supplies, Ltd., and the following contractors:—Wood & Co. (Ipswich), Mann, Egerton & Co., Ltd. (Ipswich), Bullard & Co. (Ipswich), A. W. Fisher (Ipswich), C. C. Pudney & Co. (Bury St. Edmunds), R. J. Bates & Co. (Bury St. Edmunds), and H. G. Tumilty (Dovercourt).

The E.D.A. Report.

There are a number of interesting points in the report of the British Electrical Development Association for 1926, to which brief reference was made in our last issue. The summary of membership includes 278 electricity supply undertakings (150 municipal, 14 London companies, 14 power companies, 96 provincial companies, and 4 Colonial undertakings); there are also 234 manufacturers, 1,155 contractors (including Scottish members) and 70 wholesalers, making a grand total of 1,737, showing an increase of 116 during the year. The revenue was received from the various classes in the following proportions:—Supply undertakings, 56.5 per cent.; manufacturers, 41.4 per cent.; contractors, 1.8 per cent.; and wholesalers, 0.3 per cent. The analysis of expenditure shows that a very good proportion of the funds was spent in actual propaganda work. The administrative expenses (including 12 per cent. for salaries, wages, and emoluments for special services) only absorbed 18 per cent. of the total. The largest item was "advertising towards the public, display publicity, and general Press work"—60 per cent., but the remaining 22 per cent. was also mainly spent in various publicity channels. The films owned by the Association now number 12, the latest being a 900-ft. film dealing with electricity's contribution to smoke abatement. The sales of literature during the year brought in £7,218, an increase of 130 per cent. over 1925; this, of course, included campaign literature. Other matters dealt with in the report are the Association's relations with other bodies, including the Electrical Association of Women; the Campaign; the Ideal Home Exhibition; the Electric Vehicle Committee, &c.

The Manufacturers' Agents' Association.

The council and annual general meetings of the Manufacturers' Agents' Association of Great Britain and Ireland were held on March 8th. Mr. H. Gledhill, of Messrs. Haes, Gledhill & Co., the chairman of the London Council, presided, and spoke at some length on the progress of the Association and its increasing usefulness since its inception in 1909, when from a mere handful its number has reached well over 1,000. The following councillors were re-elected for the ensuing year: Messrs. Gledhill (chairman), W. Poole (hon. secretary), A. W. Chastel (hon. treasurer), F. Martin (London hon. solicitor), L. Hazell, A. G. Leach, S. Artaud, L. Hudson, S. Boys, W. R. Stone, E. E. Taylor, J. N. Steele. There being one or two vacancies on the Council, members who were willing to give their services and attend one meeting a month were asked to send in their names to the secretary. Mr. J. Joy was asked to succeed Mr. J. H. Snow as president.

The British Industries Fair, 1926.

The recently-published official figures show that the loss on the London Section of the 1926 British Industries Fair was only £2,089. This is considered satisfactory, especially having regard to the fact that the Fair is not run for profit-making.

New Italian Companies.

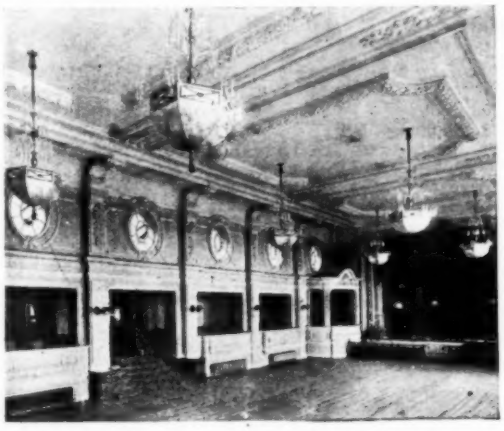
Among the concerns recently organised in connection with the electrical industry in Italy are the Società Illuminazione Elettrica Vetture, Milan, capital 60,000 lire; La Società "Isola" per la Fabbricazione di Isolanti Elettrici, Milan, capital 50,000 lire; La Società Industria Apparechi Termo-Elettro Sanitari, Milan, capital 30,000 lire; La Società "Adma" per Costruzione e Commercia di Apparechi Elettrici e di Usa Domestico, of Genoa, capital 10,000 lire; and La Società Industrie Meccaniche ed Elettrotechnici, Milan, capital 20,000 lire.

Public Service Salesmanship.

In a recent article upon "Salesmanship in Public Utility Undertakings," Mr. F. W. Goodenough, C.B.E., chairman of the Incorporated Sales Managers' Association, says that the idea still prevails that the provision of tramways, electricity, gas, and other public services, is different from selling food, clothing, &c. It is, however, as essential for the providers of such services, whether monopolists or not, to advertise as it is for the ordinary manufacturer and supplier. Moreover, good salesmen are required, and it is the duty of public utilities to adopt progressive business methods. The bestowal of the sole right to perform a certain service in an area carries with it an obligation to serve all the members of the community within that area in the best possible way. If the service is not advertised it is not used as much as it might be. Consequently the standing charges are higher in proportion to the turnover, which leads to a higher price than is necessary. Employés of public utility undertakings should be taught to be salesmen, not officials. The confidence of the public should be fostered, and complaints should be treated as opportunities for the exercise of tact, sympathy and understanding, and not as nuisances. The golden road to true success is "service."

Ball-Room Lighting.

A scheme of ball-room lighting which has recently been installed at the Majestic Hotel, St. Annes-on-Sea, is very attractive and novel. It aims at portraying the daily journey of the sun across the heavens (*pace* Galileo). Suspended from the domed and frescoed ceiling are six "G.E.C." hexagonal pendants in gilt-colour metal work with silver-plated sprigs carrying crystal drops and 36-in. marble-tinted vellum parchment bowls, each containing six orange, twelve blue, and nine



The Ballroom of the Majestic Hotel, St. Annes.

red, 60-W "Osram" colour-sprayed gasfilled lamps, each colour being wired on a separate circuit, with one 300-W white lamp in the centre. As a dance begins, the light dims to the cold pallid hue of early dawn, then slowly, scarcely perceptibly, there is a brightening which displaces the chill atmosphere and soon floods the hall with brilliant noonday sunshine. Then another change takes place, and gradually the light fades slowly to the crimson glow of sunset. The cycle is then repeated. These effects are obtained by the use of a three-way dimming device which can either be used mechanically to provide a succession of changing and intermingling colours, or locked in position to give any set colour. The fittings were specially designed by the Fittings and Fixtures Department of the General Electric Co., Ltd., to the instructions of their Manchester branch. The electrical contractors were Messrs. G. Wilkinson (Arnside), Ltd.

British Trade Exhibition at Melbourne.

The date of opening of the British Trade Exhibition at Melbourne has been fixed for February 23rd, 1928; it will be open for six weeks. The exhibition will be confined to goods made in the British Isles (not the Empire).

The Future of the Engineering Industry.

Speaking as chairman at the recent annual meeting of Cammell, Laird & Co., Ltd., Mr. W. L. Hichens said he was not one of those who thought that all we had to do was to sit still and wait for orders which were to come in abundance. The crop would not be a heavy one, and we would not secure our proper share unless we made special efforts to do so. The situation was certainly better—mainly owing to the accumulation of orders during the past year—but foreign and domestic competition was very keen, and in some branches prices were considerably cut. We could not compete on price in certain directions without a concerted effort to reduce costs all round. He was convinced that that could be done, and done without lowering the standard of living in this country. The worst possible way of meeting our industrial problems was with easy-going optimism which imagined that trade was going to improve automatically.

Lighting a Book Factory.

The lighting of the works illustrated herewith was carried out by means of "Siemens" equipment. The main building of the Greycaine Book Manufacturing Co., Ltd., Watford, has a length of 625 ft., and is 108 ft. wide. The installation consists of 60 "R.L.M." reflectors correctly spaced along each of the bays. "Siemens" gasfilled lamps are used with the

Lighting at a Large Book Factory.

reflectors, and well-distributed illumination of high value is obtained. We are informed that the company (which specialises in very cheap editions) turns out about 60,000 books a day. Twenty tons of paper enters one end of the building daily, and emerges at the other end in the form of books.

Swedish Electrical Exports.

The *Swedish Economic Review* (the organ of the Swedish Board of Trade) states that during 1926 the exports of electrical machines were valued at 27,360,000 kr. (£1,500,000), as compared with 21,026,000 kr. (£1,155,000) in 1925. At the same time the exports of telephone and telegraph apparatus rose from 7,010,000 kr. (£385,000) to 7,437,000 kr. (£400,000).

Anglo-German Industrial Discussions.

The Times, recalling the conference between German and English industrialists, in October last, says that the German representatives are anxious that the discussions should be resumed, and Mr. P. J. Hannon, M.P., one of the hon. secretaries of the movement, has been requested to extend an invitation to all the British delegates at the Broadlands conference to be the guests of Dr. Duisberg, the chairman of the Federation of German Industry, at his chateau at Leberkusen, near Cologne. The period suggested for the conference is April 29th to May 2nd.

Credenda Apparatus at Birmingham.

The Credenda Conduits Co., Ltd., has sent us a view of its stand at this year's British Industries Fair, Birmingham; this is reproduced herewith. The company's display consisted

The Credenda Stand at Birmingham.

of a wide range of domestic appliances, prominent among which was a new design of cooker. Conduits and conduit fittings were also represented, of course.

Austrian Cable Sales Combine.

Nine of the principal electric cable and wire manufacturing concerns in Austria have decided to organise a joint sales office in that city under the style of the Verkaufsgesellschaft für Isolierte Leitungen.

Wages in the Engineering Industry.

A meeting of delegates of the engineering trade unions was held in London last week to consider the resumption of negotiations for a general advance in wages. It was reported that the demand of the London District Committee for an increase of 3d. per hour had been withdrawn on the previous day in view of the proposed national negotiations. A resolution was passed empowering the chairman (Mr. J. T. Brownlie) and the secretary to communicate with the Engineering and Allied Employers' Federation with a view to arranging a conference upon the subject. It is stated that the Federation will be asked to submit an unconditional offer which will form the basis of discussions.

Australian Electrical Imports.

The imports of electrical machinery into Australia during December last attained a value of £647,000, as compared with £562,000 in the corresponding month of 1925.

Social Events.

The recently-formed dramatic section of the Magnet Operatic and Dramatic Society (General Electric Co., Ltd.) gave its first performance on March 25th at the headquarters of the Magnet Social Club, Erdington, Birmingham. Three short plays were presented—"The Marrying of William," "13, Simon Street," and "Postal Orders," in each of which a gratifying degree of ability was revealed.

The Greater London Division of the Electricity Supply Commercial Association held a dance on Saturday last, at the Poland Rehearsal Rooms, Poland Street, W.1. The attendance did not come up to expectations, but those who were present spent an enjoyable evening, for which the Sylvonia Dance Band was largely responsible. Mr. S. W. Turner, divisional secretary, and those who assisted him in arranging the event were deserving of much better support.

Some 160 members of the Liverpool and London staffs of the Automatic Telephone Manufacturing Co., Ltd., attended the fourth annual dinner which was held on March 18th, at the Exchange Hotel, Liverpool. In proposing the toast of "The Company," Mr. D. Sinclair, who presided, made some interesting references to the very early days of telephony. Sir Max Muspratt, Bt., also spoke. The dinner was followed by a musical programme.

The "Clesco" (County of London Electric Supply Co., Ltd.) Light Operatic and Dramatic Club staged "Highwayman Love," a musical play, at King George's Hall, W.C., on March 17th, 18th, and 19th. The work, which contains many tuneful airs, gave considerable scope to the principals. The chorus and Kneller Hall Orchestra, under the leadership of Mr. Arthur B. Meadows, were in splendid form. Mr. Walter E. Dossett was responsible for the production. Though the whole performance was an example of excellent team work, special mention must be made of Mrs. Lillian Sanders (Isabel, the gipsy girl), and Mr. George Mortlock (Denis O'Neill, the highwayman).

Shockproof Automobile Lamps.

Messrs. Philips Lamps, Ltd., have sent us a photograph of the results of a motor accident caused by a motor-cycle combination colliding "head on" with a motor-car. Although the headlamps of the car were completely smashed, it was found, upon test, that terrific as the impact had been, the two lamps (Philips' automobile type) were perfectly serviceable, even the delicate filaments having stood the shock.

New Chilean Company.

La Sociedad Manufacturera Electrica Curtze, Jara & Cia., Ltda., is the name of a concern which has lately been formed in Santiago, Chile, to manufacture electrical apparatus.

Trade Announcements.

MESSRS. E. & W. SHEPHERDSON, electrical engineers, of Morecambe, have transferred their business to 59, Euston Road.

The AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD., is moving into larger premises, and its address after April 9th will be:—"Winder House," Rochester Row, S.W.1. The company is installing special plant for the repair of transformers, loud speakers, headphones, &c.

The BRUNDALL & DISTRICT SERVICE CO., LTD., informs us that it has just purchased from the Receiver the electrical contracting business of Messrs. E. & C. Gates, Ltd., Arcade Street, Norwich. It proposes, after re-organising, to carry on the business, specialising in country house lighting installations.

GRAHAM AMPLION, LTD., has appointed Automobile Accessories, Ltd., 93-95, Victoria Street, Bristol, its West of England representatives for the "Graham Amplion" public speech and band repeater equipment. Tours by equipped vans are shortly being commenced.

MESSRS. PRIESTLEY & FORD, Birmingham, are entering the wholesale electrical trade, and their premises at 3, Carrs Lane, are being considerably enlarged for this purpose. They will comprise eventually three floors with extensive storage accommodation, offices, and demonstration rooms.

MESSRS. A. HUGH SEABROOK & PARTNERS, 146, Bishopsgate, E.C.2, state that they will be glad to hear from electrical manufacturers and contractors who specialise in the electrical equipment of hoists, cranes, drills, &c., in connection with quarries.

The registered offices of the EMPSON ELECTRICAL ENGINEERING CO., LTD., have been transferred from Victoria Street to 27, Chancery Lane, W.C.2. ('Phone: "Holborn 2344.")

The REGENT CYCLE STORES, which has a wireless goods department, has removed to 33, Henblas Street, Wrexham.

MESSRS. ALLENS, electrical engineers, of 40, High Street, Watford, have opened showrooms for electrical fittings and wireless sets.

MR. B. SWAFFIELD, electrical engineer, of Bedford, has removed his business from Queen Street to Lurke Street.

MESSRS. BEASLEYS, LTD., electrical and radio engineers, opened premises at 174, Mortimer Street, Herne Bay, on March 30th.

MESSRS. JOHN HARVEY & SON, electrical contractors, of Kimberley Road, Cambridge, are opening an office and showroom at 1, Wheeler Street, Cambridge.

New Catalogues and Lists.

THE MARCONIPHONE, LTD., 210-212, Tottenham Court Road, W.1.—A coloured poster advertising the company's h.t. supply unit for receiving sets, and a leaflet illustrating a handsome window display for "Marconi" valves.

MESSRS. ALLEN-LIVERSIDGE, LTD., Victoria Station House, Westminster, S.W.1.—An illustrated brochure dealing with the applications of acetylene and electric welding to the repair of road transport vehicles.

THE HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, E.15.—A large coloured poster (5 ft. by 3 ft. 6 in.) advertising "Hart" batteries for automobile starting and lighting.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.—List No. 470, containing illustrations and prices of "Sunnix" dustproof lighting fittings; and an illustrated folder dealing with "A.B.C." electric washing machines, "Sunshine" vacuum cleaners, and Johnson's electric floor polisher.

THE VINCENT SWITCHGEAR MANUFACTURING CO., LTD., Sampson Road North, Birmingham.—A pamphlet containing illustrated particulars and prices of "Vincent" circuit dividing fuses.

MR. J. E. STOTT, 15, Clare Hill, Huddersfield.—Illustrated leaflets dealing with the "S-An-S" electric wash boiler, and electric lamps.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A leaflet advertising "Pearl Elasta" (internally-frosted) gas-filled lamps.

MESSRS. F. T. MURDOCH & CO., LTD., Thompson Street Works, Belfast.—Three illustrated leaflets advertising the company's hoisting and stacking equipment.

BERRY'S ELECTRIC, LTD., 85-86, Newman Street, Oxford Street, W.1.—A priced and illustrated pamphlet describing the company's new "Hous" switchfuse.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—An illustrated booklet telling "The Story of 'Mazda' Electric Lamps," which was distributed at the Ideal Home Exhibition.

FACTUM, LTD., 17, Soho Square, W.1.—Price lists of electric lamps, clear, opal, and coloured.

HIGGS MOTORS, Witton, Birmingham.—March-April stock list of a.c. and d.c. motors.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—An illustrated booklet (No. 110) dealing with battery trucks, stackers, &c.

SKY PRINTERS, 20, Church Road, Seaforth, Liverpool.—A pamphlet describing a novel method of "sky writing."

MESSRS. E. J. & J. PEARSON, LTD., Firebrick Works, Stourbridge.—A comprehensive catalogue (95 pp.) of the company's fireclay products. The works are described, examples of the company's work are illustrated, and, in addition, a great deal of useful data is included.

RADIO COMMUNICATION CO., LTD., 34-35, Norfolk Street, Strand, W.C.2.—List B/127—an illustrated description of the company's ½-kW transmitter, &c., for marine communication.

ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10.—A priced and illustrated folder dealing with the "Utility" electric radiator fitted with "Globar" elements.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, W.C.1.—An illustrated folder fully describing the "R.I." h.t. supply unit for a.c. mains. Priced. Particulars are also given of the components necessary for the building of battery eliminators for a.c. and d.c. circuits.

MESSRS. W. B. TREW & SON, Kingsbury Works, Kingsbury, N.W.9.—An illustrated pamphlet advertising "Tru-Ray" high-frequency electro-medical apparatus. Priced.

Bankruptcy Proceedings.

R. P. REEVES, trading as the Luxray Spotlight Projector Co., late of 5, Says Corner, North Quay, Great Yarmouth, electrician.—The adjourned public examination of this debtor was held on March 23rd, at the Town Hall, Great Yarmouth. The statement of affairs showed liabilities of £1,041 and a deficiency of £954. The debtor had previously failed to attend for his public examination on two occasions. He said that he went to Reading for a year to learn engineering, and returned to Yarmouth in 1919 and obtained a position with a firm of engineers. Then he became an apprentice for five years ending 1925. He invented and patented a projector to throw a concentrated beam of light from a small power lamp. He commenced to trade, and received a contract from

a hospital for £30. His profit on that contract was about £16, and he sold lamps for various companies. He admitted that he owed £100 when he commenced business. Last August he purchased the premises and spent £200 on alterations and an electrical installation, and £40 on office furniture. He employed a traveller as he hoped to find customers in large cities. He had sustained a net loss of £386. The examination was closed.

C. P. MOODY (trading as the South-Eastern Manufacturing Co.), Crown Works, Finck Street, Lambeth.—The first meeting of creditors was held on March 21st, at the London Bankruptcy Court. The debtor, who filed his petition on March 7th, states that in March, 1920, he commenced business as a maker of Leclanché batteries. Owing to lack of capital the business fell away, and he endeavoured to secure agencies for other goods. He estimated his liabilities at £800, against assets £67, and in the absence of any resolution the case was left in the hands of the Official Receiver. The cause of the failure was said to be keen competition.

E. W. KIRK, lately trading as the Ace Radio Manufacturing Co., 26, Curzon Street, Derby.—The public examination of this debtor was held on March 22nd, at the Court House, Derby. The statement of affairs showed liabilities of £270, against assets of £16. Debtor stated that his radio business was never really successful, and eventually he sold a patent for a radio coil to a London firm for £75. The coal dispute seriously injured his business, and he closed down. He was now in employment, and offered £2 a week towards his debts. The examination was closed.

S. A. WARDELL, electrical engineer, 83, Raleigh Road, Richmond, Surrey.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C., released March 15th.

C. W. WATSON, electrical and wireless engineer, 33, Rainhall Road, Barnoldswick, Yorkshire.—First and final dividend of 1s. 0½d. in the £, payable March 25th, at the Official Receiver's offices, 12, Duke Street, Bradford.

E. TEMPLE and MRS. J. E. BURKETT (Westoe Electrical Co.), wireless dealers and electrical contractors, 105, Canterbury Street, South Shields.—Receiving order made March 21st, on debtors' own petition.

S. H. BARDWELL (Bennett, Bardwell & Co.), electrical engineer, 22, Church Street, Basingstoke.—Trustee, Mr. H. Ashton, Official Receiver, Midland Bank Chambers, High Street, Southampton, released March 16th.

J. E. W. ARCHER, watchmaker and wireless dealer, 259, Crookes, Sheffield.—First and final dividend of 1s. 8½d. in the £, payable at the Official Receiver's office, 14, Fig Tree Lane, Sheffield.

T. F. COLLIER, electrician, 116, Union Street West, Oldham.—First meeting, April 1st, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, April 13th, at the Court House, Oldham.

F. C. GOSS, electrical engineer, 32, Windsor Road, St. Andrew's Park, Bishopston, Bristol.—Application for discharge to be heard April 29th, at the Guildhall, Bristol.

S. PURCELL, electrical contractor, The Arcade, Goole, Yorks.—Trustee, Mr. B. S. Briggs, Official Receiver, 21, King Street, Wakefield, released March 16th.

Company Liquidations.

LOUIS SAMUEL, LTD., wireless dealers, late 54, Gracechurch Street, E.C.—A meeting of creditors was held on March 22nd, at the Institute of Chartered Accountants, E.C. The chair was occupied by Mr. W. F. Baker, 97, Mortimer Street, W., who had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented showed liabilities of £1,456, of which £989 was due to the trade and £466 to Mr. Samuel. The assets were estimated to realise £220 (net). The company was registered on December 5th last, with a nominal capital of £500, but only two signatory shares of £1 each had been issued. The company took over the business which had previously been carried on by Mr. Samuel. Some creditors had stated that they did not recognise the company, but were looking to the vendor. That might reduce the liabilities to the trade, but it would increase the claim which Mr. Samuel would have against the company. Mr. Baker said that there was no actual agreement with Mr. Samuel, but the goods for which creditors were claiming passed to the company, and Mr. Samuel would have a claim against the company for their value. Since the company had been formed the sales had been £979, whilst the purchases had amounted to £621, and after allowing for all the expenses there was a net loss of £542. Towards the end of February a creditor levied execution, whilst the company was also threatened by the landlord. Mr. A. Samuel, the father of the active director, agreed to lend £100 to the company on the security of a debenture. Mr. Baker said that when he was consulted he advised that it was impossible for the business to be continued. A creditor inquired who "Smarts" of Gracechurch Street were, and Mr. Baker replied that that was the original name adopted for the business, and he understood that the goods had been ordered in that name, but were paid for by Louis Samuel, Ltd. Another creditor asked if there was any connection between the company, and a firm known as "Hamilton"; Mr. Baker said there was not, but he understood that Mr. Samuel started the business by buying certain stock from the liquidator of "Hamiltons." A resolution was passed confirming the voluntary liquidation of the company with Mr. Baker as liquidator, and an advisory committee was also appointed, consisting of the representatives of the Radioland Co., Ltd., Houghton-Butcher, Ltd., and V. Zeitlin and Son. The following are creditors: —

	£		£
East London Rubber Co.	20	Radioland Co., Ltd. ...	166
Ewart Evans, Ltd. ...	90	Reynolds, W. H. (1923), Ltd.	21
Grimshaw, Baxter, and J. J. Elliott	40	S.D.H. Manufacturing Co., Ltd.	31
Houghton-Butcher, Ltd.	104	Scientific Glassware Co.	48
Lever, Eric J.	75	S-T., Ltd.	21
Melbourne Radio Supply	26	Samuel, Louis	466
Mullard Wireless Service Co., Ltd.	22	Wells, Joseph, & Son, Ltd.	47
Radio Communication Co., Ltd.	20	Zeitlin, V., & Son ...	76

JOHN BELL & CROYDEN, LTD.—A resolution for the voluntary liquidation of this company was passed at a meeting of creditors last week. The liabilities were stated to be £59,193 and the net assets £34,181, leaving a deficiency of £25,011 so far as the creditors were concerned. The original authorised capital of the company, £150,000, was increased to £175,000, and subsequently reduced to £42,750. Arrangements had been made to sell the business, but it was reported that the proceeds of the sale would not be sufficient to discharge the claim of the first debenture holder. Messrs. P. S. Booth and H. Hackett were appointed joint liquidators with a committee of inspection.

ASTER ENGINEERING CO. (1913), LTD.—Winding up voluntarily. Liquidator, Mr. S. D. Begbie, of Wembley, with powers to enter into an agreement with Arrol-Johnston, Ltd., on terms arranged, and to dispose of the selling rights of the Aster cars to a new company. Meeting of creditors, April 6th, at 50, Gresham Street, E.C. Particulars of claims to the Liquidator by April 30th.

CARPAX CO., LTD.—Particulars of claims by May 3rd to the Liquidator, Mr. J. Wilson, 2, St. James Square, Manchester.

SOUTHERN COUNTIES ELECTRIC LIGHT AND POWER SUPPLY, LTD.—Winding up order made by the High Court, March 22nd.

New Municipal Showrooms.

The accompanying picture is a view of the new showrooms recently opened by Accrington Electricity Department in Whalley Road. Before proceeding with the work the Corporation made an extensive investigation into the schemes carried out by other municipal electricity supply authorities, and the result is the embodiment of all that is up-to-date in the

The New Accrington Showrooms.

design of the premises. As will be seen the showrooms have an extensive window frontage permitting of uncrowded and distinctive displays. It is reported that the new premises have already had a beneficial effect upon the sale and hire of electrical apparatus in Accrington.

Proposed Austrian Tariff Changes.

A number of alterations proposed in certain Austrian Customs duties are set out in the *Board of Trade Journal* dated March 24th. Among the commodities affected are pipes and tubes the duties upon which are, in most cases, to be raised. The duties upon "shaped parts of glass or other insulating material (except hardened rubber or porcelain) for electrical purposes, not equipped, weighing less than 600 gr. each" are increased from 19 and 25 gold kr. per 100 kg. to 140 kr.

A Novel Fire Escape.

Messrs. Merryweather & Sons, Ltd., have recently supplied to the Leicester Corporation a new type of turntable fire escape with which is combined a fire pump. The appliance possesses several novel features, among which are a searchlight and a telephone for communicating from the ground with a fireman at the top of the 85-ft. ladder.

D

The Free State Radio Apparatus Duty.

A joint committee representative of the Wireless Retailers' Association of Ireland, the Wireless Society of Ireland, and a number of firms engaged in the radio apparatus trade in the Irish Free State is urging upon the Free State Minister of Finance the abolition of the 33⅓ per cent. *ad valorem* duty upon imported radio sets. It is stated that incalculable harm is being done to the industry by this duty, and if it were remitted the number of licence holders would rapidly rise from the present figure of 30,000 to about 100,000.

For Sale.

Southampton Electricity Department has for disposal a 38-ton per hour disused gravity bucket conveyor, complete with motor, &c.; Dartmouth Corporation invites offers for two 48-h.p., 480-V, d.c. motors, with spares. Mr. H. J. Shaw will sell by auction on April 7th, at 13, High Holborn, W.C., various trade stocks of wireless and electrical goods, &c.; Blackpool Co-operative Society invites offers for surplus electrical plant. (See our advertisement pages to-day.)

Book Notices.

Publications of the Association of Engineering and Shipbuilding Draughtsmen.—"The Craft of Tracing."—A short exposition of what may be considered the accepted methods of tracing; prepared by the National Technical Sub-Committee of the Association Executive. "E.h.t. Switchgear and Breakers." By G. L. E. Metz.—A pamphlet presenting valuable data on the design, primarily of oil circuit breakers, but also in a lesser degree of air circuit breakers, which have been collected. The general duties and the various working conditions and characteristics of the breaker are defined as well as the machine conditions under which it has to operate. The calculation of the rupturing capacity and considerations of the stresses to which the breaker is subjected are features of the work. Copies of each of the above may be obtained from the Association secretary, price 2s. each.

"Municipal Year Book, 1927." Pp. lxxix+900. London: Municipal Journal, Ltd. Price 15s. net.—In the new edition of this year book, several improvements have been introduced; the introductory matter relating to the various towns has been revised, extended, and brought up to date, the rural districts section has been considerably improved and added to, and the names and addresses as well as the principal officials of the various municipal authorities in Northern Ireland and the Irish Free State, are included; hitherto information relating to the six principal cities only has been given. As in previous years, the financial results during the year 1925-26 of electricity, tramway, railless traction, and other undertakings are given, as well as the legislation under which these undertakings have been established and are operated.

"Southampton Docks, 1927" (pp. xliv+147). London: The Southern Railway Co.—This brochure contains very full information regarding the facilities available at the Southampton Docks and sets out the charges for the handling and storage of goods, &c.

A list of "5,000 practical books" has been received from the Popular Mechanics Press, 635, St. Clair Street, Chicago, U.S.A.

"Scientific Papers of the U.S.A. Bureau of Standards." Vol. 21, No. 537, Formula for the inductance of a helix made with wire of any section. (25 cents.) Vol. 21, No. 542, Electric field of a charged wire and a slotted cylindrical conductor. (10 cents.)

"Circular of the U.S.A. Bureau of Standards." No. 17. Magnetic Testing. (15 cents.)—This circular contains a brief discussion on magnetic quantities and characteristics of materials, and outlines the various methods used by the Bureau for the magnetic testing of commercial materials.

"Science Abstracts (A and B)." Vol. XXX. Part 3. March 25th, 1927. London: E. & F. N. Spon, Ltd. Price 3s. each net.

Canary Islands Trade.

In a recent report on the Canary Islands (Department of Overseas Trade: Stationery Office, 1s. net.) Mr. P. Helyar, British Consul at Teneriffe, shows that 39 tons of electrical material was imported during 1925. The origins of this were as follows:—Germany, 19 tons; Spain, 6 tons; France, 5 tons; Belgium, 5 tons; United Kingdom, 4 tons. The total amount of telephone material imported was 78 tons, which came from the following sources:—Norway, 36 tons; Belgium, 22 tons; Holland, 17 tons; Germany, 3 tons.

Electric Power in Industry.

Continuing its series of supplements dealing with the Census of Production, the *Board of Trade Journal* for March 24th contains particulars relating to further branches of industry. In connection with the motor and cycle trades it is shown that in 1924 they had, collectively, generating plant of a capacity of 25,010 kW installed, as against 2,225 kW in 1907. The aggregate power of electric motors installed was 171,696 h.p.; power for 142,101 h.p. was purchased. In the seed-crushing industry the generating plant had a capacity of 15,625 kW (against 1,096 kW in 1907). The aggregate power of the industry's electric motors was 40,964 h.p. (energy purchased for 22,987 h.p.).

The soap and candle trades' generating plant rose from 3,837 kW in 1907 to 18,396 kW in 1924. Although the installed electric motors had an aggregate power of only 19,965 h.p., energy for 9,855 h.p. of these was purchased.

The Canadian Power Industry.

In a review of the expansion of the electric light and power industry in Canada, the Royal Bank of Canada states that the industry now ranks first among Canadian manufacturing industries in terms of capitalisation, with an aggregate amounting to more than $700,000,000, and sixth among the industries in terms of annual gross income, this amounting to well over $100,000,000 a year. As the present installation represents the development of only 10 per cent. of the recorded waterpower, the Waterpower and Reclamation Service has estimated that during the next 20 years the expenditure for new installations will exceed one billion dollars.

The Contractors' Convention.

We have received the provisional programme of the second annual conference of the E.C.A. Allied Associations, which is to be held at Scarborough from June 22nd to 25th inclusive. The first day is to be devoted to a council meeting and a reception by the president (Mr. H. J. Miles). The annual general meeting is to be held on the 23rd at Olympia (Scarborough). After an address of welcome by the Mayor, Mr. Miles will deliver his presidential address, and in the afternoon a paper on "Some Interesting Points on Modern Installation Work" will be read by Mr. R. Grierson (Grierson, Ltd.). A smoking concert will be held at the Grand Hotel in the evening. On the following day (Friday, June 24th), Mr. J. Kirkham (Rawlings Bros., Ltd.) will read a paper on "Estimating and Costing for Electrical Contractors," followed by Mr. H. E. Walker (Walker Bros., Birmingham), whose subject will be "The Electrical Showroom as a Commercial Proposition and its Relation to the Industry." The business proceedings will terminate with a short address by the new president. Friday afternoon and Saturday will be occupied by social functions, excursions, &c.

A folder is being issued giving particulars of accommodation available, registration forms, &c. The conference fee will be the same as last year, *viz.*, 25s., plus 7s. 6d. hotel deposit which will be deducted from the hotel bill. All applications to attend the conference should be addressed to the General Secretary, Mr. L. C. Penwill, 15, Savoy Street, Strand, W.C.2.

Local Exhibition.

BLACKBURN.—At an exhibition in the Public Hall, Blackburn, which was opened on March 29th, by Dr. J. Ramsay, deputy mayor, there was an excellent display of electrical appliances and labour-saving devices. The stand of the British Electric Polisher, Ltd., attracted considerable attention.

Recent Contracts.

MESSRS. RICHARD GARRETT & SONS, LTD., have recently received an order from the Società Imprese Elettriche dell America Latina for six Continental-type low-loading electric trolley-'buses for service in Lima, Peru, by the Lima Light, Power & Tramways Co. A fleet of five Garrett trolley-'buses has recently been supplied to the Nordsjaellands Elektricitets og Sporvejs Aktieselskab, of Kellerup, near Copenhagen. The vehicles are of the latest low-loading type, fitted with standard "Bull" motors and "Garrett" drum-type controllers. These are the first electric trolley-'buses to be put into service in Denmark.

INTERNATIONAL COMBUSTION, LTD., has received a repeat order from the Derby Corporation Electricity Department for an 80,000-lb. boiler complete with drying equipment, "Lopulco" water-cooled combustion chamber, superheaters, economisers, draught equipment, dust-catching apparatus, and stacks. It is claimed that the original installation showed an efficiency of 88.45 per cent., when employing fuel of 9,930 B.th.u. per lb. average calorific value. During a trial conducted by an independent consulting engineer it was established that the boiler plant, when isolated on to a 10,000-kW turbo-generator (with an average load of 3,300 kW), produced electricity at a consumption of 19,100 B.th.u. per kWh.

MESSRS. COCHRANE & CO., LTD., of the Ormesby Ironworks, Middlesbrough, have received official intimation that their tender for the supply of 7,000 tons of cast-iron pipes to the Municipal Council of Port Elizabeth, Natal, has been accepted. The contract was secured against keen French and German competition.

Unemployment.

During the week ended March 14th there was a decrease of 25,360 in the number of unemployed. At that date the total was 1,118 700, as compared with 1,144,060 on March 7th, and with 1,070,843 on March 15th, 1926.

New Australian Companies.

Dux Electric Heaters (N.S.W.), Ltd., was recently registered in Sydney, with a capital of £100,000, to acquire an existing business, the nature of which is indicated by the title.

Another new Sydney registration is the Gloucester Electric Supply Co., Ltd., capital £10,000, to acquire a business of automobile, electrical and marine engineers, &c.

The Country Electric Supply Co., Ltd., capital £35,000, has also been registered recently in Sydney. This company has an agreement with the Murrurundi Council for the supply of electricity in the Council's area, and it will also carry on the business of electricians, electrical engineers and manufacturers, &c.

In Melbourne, Telephones and General Engineering Pty., Ltd., has been formed, with a capital of £100,000.

Trade Marks in Northern Europe.

Delegates of Sweden, Denmark, Norway and Finland are to meet again at Oslo on May 2nd to discuss a basis of common legislation on trade marks in the North European countries. These negotiations were initiated at a conference held at Stockholm last autumn.—*Reuter's Trade Service* (Stockholm).

Prices of Raw Materials.

Messrs. F .Smith & Co. report, March 29th: Copper (electrolytic) bars, £63, 2s. 6d. dec.; ditto ditto sheets, no change; ditto ditto wire rods, £73, 2s. 6d. dec.; ditto ditto h.c. wire, 9 3/16d., 1/16d. dec.

Messrs. James & Shakespeare report, March 29th: Copper bars (best selected), sheet and rod, no change; English pig lead, £28 5s., 30s. dec.

Messrs. Edward Till & Co. report, March 29th: India rubber, Para fine, no change.

Messrs. C. Clifford & Son report, March 29th:—Babbitts metal and anti-friction metal, Grade I, £268, £6 dec.; Grade II, £186, £4 dec.; Grade III, £96, £2 dec.

Lighting and Power Notes.

Bexhill.—ELECTRICAL DEVELOPMENT.—The Corporation Electricity Committee has received a letter from the Electricity Commissioners stating that, having regard to the probability that further provision will have to be made in the near future in respect of supplies in the Little Common area, the Council should review the probable requirement of that area with a view to determining the proper course of development. The Committee has recommended that the Commissioners be informed that the electrical engineer has already reported upon this matter, and that it is proposed to go fully into the subject in the early part of next year.

LOAN SANCTIONED.—Sanction has been received to the borrowing of £5,000 for mains and £216 for switchgear.

Brackley.—ELECTRICITY SUPPLY.—The Town Council has been notified by Messrs. Cecil Cooper & Co. that they have applied for sanction to supply electricity in the district. The charges for the first year will not exceed 10d. per kWh for private lighting, 6d. per kWh for public lighting, and 4d. per kWh for power.

Bradford.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee has approved an assisted wiring scheme for small dwellings. According to the *Yorkshire Observer* the scheme will be limited to 20-point installations. The department will be prepared to wire houses for the number of points required for lighting and for any additional points required for heating. The payments for installations up to eight lighting points, with one five-ampere plug and two ten-ampere plugs, will be £2 down and sixteen quarterly payments, varying according to the installation required. In the case of installations with more than eight lighting points the terms are to be 20 per cent. down, and sixteen equal quarterly payments. These provisions will be subject to confirmation or modification in Council. The wiring will be carried out by registered contractors.

ELECTRICAL PROGRESS.—The output of electricity since the beginning of April last is reported to have increased by nearly 4½ million kWh, as compared with the corresponding period of the previous year.

Brigg.—ELECTRICITY SUPPLY.—The Urban District Council has requested Messrs. A. Hugh Seabrook & Partners to revise their report on electricity supply, submitted two years ago, and bring it up to date, with a view to taking definite steps in the matter.

Chile.—ELECTRICAL DEVELOPMENTS.—*Commerce Reports* states that the Sociedad Carbonifera de Marfil has been awarded by a recent Government decree, a 50-year concession to supply the city of Valdivia and adjacent districts with electricity.

Continental.—FINLAND.—The Niskakoski Rapids, in Northern Finland, capable of developing 25,000 h.p., have been purchased by British investors. It is proposed to erect a power station.—*Commerce Reports.*

GERMANY.—The Markische Elektrizitätswerke Gesellschaft has recently put into operation a large new steam-operated power station at Finkenheerd, near Frankfort-am-Main, with the object of supplying power to the greater part of the German province of Brandenburg. The site for the station was selected on account of its proximity to lignite mines from which the necessary fuel can be conveniently drawn. The initial generating plant comprises two A.E.G. steam turbo-alternators, with a capacity of 16,000 and 12,500 kW respectively. Two 15,000-kVA, 6,500/52,500-55,000-V oil-cooled transformers have also been installed, these being directly connected up to the generators. A further 30,000-kW set is at present being installed, and the station will eventually have a capacity of from 100,000 to 125,000 kW. The initial steam-raising plant comprises five Babcock & Wilcox and five Steinmuller water-tube boilers, each having a heating surface of 6,996 sq. ft., with 5,166-sq. ft. pre-heaters and 2,152-sq. ft. superheaters. For the plant at present in course of installation four boilers working at a pressure of 40 atmospheres and giving steam at a temperature of 425 deg. C. will be utilised.

FRANCE.—The Chamber of Deputies has voted the Bill for the utilisation of the hydro-electric power obtainable from the fall of Kembs (Upper Rhine). The works will include the construction of a lateral canal, and the total expenditure is estimated at 251 million fr.—*Reuter* (Paris).

Darwen.—INQUIRY.—An inquiry was held recently by Col. T. C. Ekin, for the Electricity Commissioners, into the application of the Corporation to extend its generating station by the installation of one 2,000-kW set. The Town Clerk said it became necessary some years ago to increase the local generating station or obtain supplies from other sources. Actuated by the high cost of construction at that period, the Corporation decided to purchase in bulk from Blackburn. By a judicious use of that supply, coupled with the town's own production, the joint agreement between the two Corporations had worked satisfactorily. Later it became apparent that the time could not be long delayed before further plant would have to be installed if electricity was to be supplied locally at a commercially practicable rate, and the Electricity Committee therefore framed a scheme showing the relative advantages of installing a 2,000-kW turbo-alternator in substitution for one of its smaller sets, as compared with the continued reliance on Blackburn's supply. Investigations showed that it was in the financial interests of Darwen to generate its own electricity rather than take bulk supplies.

Duntocher (Dumbartonshire).—ELECTRICITY SUPPLY.—At a recent public meeting, a deputation was appointed to interview the Clyde Valley Electrical Power Co. with regard to a proposal to obtain an electricity supply for the district.

East Dereham.—ELECTRICITY SUPPLY.—The Urban District Council has instructed the Clerk to arrange with the Norwich Town Clerk for the preparation of a draft contract for the supply of electricity to the Council for a period of 21 years on the following terms:—£4 10s. per kW of maximum demand, plus 0.71d. per kWh, Norwich Corporation to lay the main from Wymondham to Dereham gas works at its own expense.

Epsom.—ELECTRICITY IN SMALL HOUSES.—The Town Council has decided to supply electricity to houses on the Horton estate for lighting, heating, cooking, &c., at an annual charge of £3 12s. per house, plus 1½d. per kWh.

Ilford.—LOANS.—The Electricity Committee is making application for sanction to loans of £2,000 for wiring installations and £2,000 for the purchase of electrical apparatus to be let out on hire.

India.—PYKARA SCHEME.—It is understood that the Government of Madras has under contemplation the appointment of a hydro-electric expert to advise it on further progress of the Pykara scheme and to deal with the terms and conditions of the railway electrification. An announcement will be made as soon as an expert is secured.—*Indian Engineering.*

Irish Free State.—KILLARNEY.—At a recent meeting of the Urban Council a letter was read from the Minister for Industry and Commerce, stating that he had received an application from the Kerry Electric Supply Co. for permission to erect electric mains in certain streets of the town of Killarney. The company stated that it had applied to the Council for permission to erect the necessary poles in the streets, but that its request had been refused. The Ministry has requested the Council to state its objections to the company's proposal, and the Town Clerk was directed to reply setting out the Council's objection to the erection of overhead lines in the streets.

Leek.—ELECTRICITY IN BULK.—The electrical engineer of the Urban District Council is negotiating with the Stoke-on-Trent Corporation for a bulk supply of electricity. It is proposed to take a supply of from 1,500,000 kWh to 5,000,000 kWh per annum, with a maximum load of 1,500 kW.

London.—BATTERSEA.—Application is being made by the London Power Co., Ltd., for consent to establish a new generating station at Nine Elms.

POPLAR.—Sir Andrew Duncan, chairman of the Central Electricity Board, has consented to open the new generating station on April 25th next.

CHISWICK POWER STATION.—The *Financial News* reports that the London and Home Counties Joint Electricity Authority has signed an agreement with the Chiswick Urban District Council to acquire from the Council over 44 acres of the Duke's Meadows on which to erect a generating station. The agreement will be scheduled to the new Bill, which, with the assent of the Standing Orders Committee of Parliament, will shortly be introduced into the House of Commons in substitution for the Bill which failed to comply with the Standing Orders.

Paignton.—PURCHASE OF UNDERTAKING.—The Urban District Council has appointed Mr. J. H. Rider, consulting engineer, to prepare a preliminary report on the proposal to purchase the electricity undertaking of the Paignton Electric Light and Power Co., Ltd.

Plymouth.—ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee, on March 22nd, approved a recommendation of the electrical engineer, Mr. E. G. Okell, for the provision of a h.p. feeder cable to St. Budeaux in order to meet the increasing demand in the Swilly and St. Budeaux districts and to complete a ring main for the greater security

of supplies throughout the area, in which there are now over 1,870 consumers. It was pointed out that the extension would involve the erection of a sub-station at St. Budeaux and the provision of additional transformers and switchgear at a total estimated cost of £20,996. Application is to be made for sanction to borrow the necessary money. The Committee also authorised cable extensions in 18 streets.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SMETHWICK, OLDBURY, AND EVESHAM.—*The Shropshire, Worcestershire and Staffordshire Power Co.*: Lighting: The surcharge of 7½ per cent. has been withdrawn.

AYLESBURY.—The temporary increase of 10 per cent. made to domestic, business, and power consumers, has been removed.

HORNSEY.—The 10 per cent. increase to be terminated.

Shipley.—LOAN.—The Urban District Council is applying for sanction to borrow £2,500 for the purchase of electrical domestic apparatus to be let out on hire.

South Africa.—CAPE TOWN.—The Corporation Electricity Committee reports that in the immediate future the Council will be laying the Electricity Commission's cables between Glencairn Quarry and the traction sub-station at Glencairn and it is suggested that the opportunity be taken to lay a 11,000-V cable between the Quarry and Glencairn Village. Supply to the far end of Kalk Bay, Fish Hook, and the Quarry depends on a single cable, and there is no doubt that a duplicate supply will have to be provided before very long. The cheapest and most economical way of obtaining this duplicate supply will be to take energy in bulk from the Electricity Commission's 33,000-V transmission system at Glencairn sub-station. By laying the cable now there will be a considerable saving in excavation and handling charges, and in the interim, capital charges on the cable can be covered by supplying Glencairn Village.

LOAN.—The Corporation is to raise a loan of £500,000 for electricity purposes.

Southend-on-Sea.—MAINS EXTENSIONS.—The Town Council has decided to carry out mains extensions, including a supply to Southbourne Grove, at an estimated cost of £3,000, subject to a Special Order being obtained to carry out the extension.

South Shields.—STREET LIGHTING.—The Corporation is considering a scheme submitted by the borough electrical engineer for the conversion of 1,000 street lamps from gas to electric lighting.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Southend-on-Sea Corporation, authorising it to supply electricity in the urban district of Canvey Island and the rural district of Rochford; the Clacton Urban District Council, to supply in certain parishes in the rural district of Tendring; and the Cleveland and Durham County Electric Power Co., for the amendment of the South Durham Districts Electricity Order.

Stirling.—ELECTRICITY IN BULK.—In accordance with the plan for linking up electricity undertakings in Central Scotland, the Town Council, instead of laying down new plant to meet the growing demand, will take a bulk supply from the Scottish Central Electric Power Co., whose cable runs through the town. The agreement is to be for a period of five years. The cost will be £1 2s. 6d. per quarter per kW of the maximum demand, plus 7/10d. per kWh for electricity consumed. The Council is to erect the necessary sub-station, subject to the approval of the Electricity Commissioners.

Stoke-on-Trent.—ELECTRICITY SUPPLY.—The borough electrical engineer has reported to the Electricity Committee that the Electricity Commissioners have suggested to the Newcastle-under-Lyme Corporation that the supply for next winter's load should be taken from Stoke instead of installing a new generating set.

The Committee has asked the electrical engineer to prepare a scheme for a supply of electricity to Endon.

SUPPLY TO FACTORIES.—A report was submitted to the Committee upon the position with regard to factory supplies, and the electrical engineer was asked to prepare scales of charges, based upon load factor and consumption, with a view to reductions in the price to factories taking large quantities of electricity.

Swansea.—STREET LIGHTING.—At a recent meeting of the Highways Committee the borough engineer reported that he had conferred with the borough electrical engineer with regard to the question of converting public lamps from gas to electric lighting in all streets where public lighting cables had been laid, and the latter had agreed to recommend his Committee to extend the cables in certain streets. It has been arranged to take over 935 of the existing gas lamps in various areas. When the work is completed the whole of the east side of the river, north of Morris Lane, up to Llansamlet, and the whole of the Oystermouth and West Cross district, will be lit by electricity. The borough electrical engineer was further prepared to connect 42 new lamps which it is proposed to erect in the near future principally in the Winchwen and Trallwn area, to the electricity mains. With regard to the public lighting of Ynistawe, it was reported that Messrs. Player & Son had been given six months' notice to terminate the present contract, and that at the expiration of that time the public lighting of this area would be undertaken by the Corporation's Electricity Department. A supply will then be given from underground mains and new and improved lamps will be provided if allowance is made in next year's estimates for the cost of the necessary work.

West Midlands.—PLANT EXTENSIONS.—Mr. S. T. Allen, chief engineer of the West-Midland Joint Electricity Authority, in a recent paper before the Birmingham Electric Club, referred to the big developments in progress. He explained that the area over which the West Midland Authority had control covered over 1,000 square miles, and extended roughly from Tamworth to the Welsh border and from Stafford to Halesowen; it embraced 60 boroughs, urban and rural districts and parishes. The whole of the generation would be carried out under one control, and the supplies of electricity required by the existing owners of generating stations would be sold at cost price; in effect, the scheme was a co-operative movement. Immediate provision had been made for the erection in sections of a new capital station at Ironbridge, and provision would subsequently be made, in anticipation of the growth of demand, for the erection in sections of a further capital station. The Birchills and Ocker Hill generating stations were being extended with plant to cost £366,000; an order for 33,000-volt, 500,000-kVA capacity (and other) switchgear, covering an expenditure of approximately £125,000, had just been placed—perhaps one of the largest single orders for switchgear ever placed in, and for, this country.

Wolverton.—OPPOSITION TO SCHEME.—At a public meeting held on March 23rd, a resolution was passed protesting against the use of overhead mains by the Northampton Electric Light and Power Co., Ltd., and the meeting pledged itself to decline the use of electricity unless underground mains were used. A copy of the resolution is to be sent to the Ministry of Transport.

Tramway and Railway Notes.

Continental.—BELGIUM.—A scheme is under consideration for the construction of an electric tramway between Courtrai and Mouscron. The line is estimated to cost about £98,500, of which the Belgian Government would be responsible for one fourth.

Japan.—REVISION OF ELECTRIFICATION SCHEME.—The Imperial Government Railways have decided to revise the electrification scheme from the next fiscal year. According to the revised plan only some of the Tokio, Osaka and Kyoto suburban lines will be electrified at present, and the electrification of the whole of the Tokaido line has been postponed. In connection with the electrification of the Otsu-Akashi line, which will be commenced in the fiscal year 1929-30, the I.G.R. is to erect a hydro-electric power station near Osaka, and a steam power plant as a reserve between Osaka and Kobe.

RAILLESS-CAR SCHEME.—Application has been made by Mr. G. Takeuchi, of Shimodate-machi, Ibaraki-ken, for permission to introduce a railless car service from Shimodate-machi to Makabe-machi, a distance of nine miles, at a cost of 117,000 yen.

RAILWAY EXTENSIONS.—The Municipal Assembly of Osaka has under consideration four schemes of extensions to electric railways in the city. They include the proposed Japan Electric Railway (a rapid transit railway) between Tokio and Osaka, the Sumiyoshi Electric Railway, with a capital of 2,000,000 yen from the city to Kosaka-machi, the Nankai Rapid Transit Railway, with a capital of 10,000,000 yen, from the city to Sano-machi, and the Hanshin Electric Railway to be extended from Kobe to the city, with a capital of 30,000,000 yen.

London.—INQUIRY.—The Ministry of Agriculture held an inquiry recently into the proposed purchase of land at Southgate by the London Electric Railway Co. Mr. W. L. Lloyd Roberts, for the company, said the land was required for the development of the tube north of Finsbury Park. It would be an extension of the Piccadilly line. He quoted the recent London Traffic Report suggestion that the railway should be extended to Wood Green or Southgate. After the company had looked into the matter it came to the conclusion that it could construct such a railway and would purchase such land with a view to doing so. The assistant secretary and treasurer of the London Electric Railway Company said it was proposed to provide sheds for 172 cars.

UNDERGROUND GOODS RAILWAY.—The entire board of the London Goods Railways, Ltd., formed last year to construct underground goods tubes in the London district, has been reconstituted. According to *Modern Transport*, the new directors are Viscount Elibank (chairman), Colonel R. C. L. Jervis, Sir Arnold B. Gridley and Mr. W. W. Paine. Plans are being prepared, it is stated, and it is expected that the enterprise will cost between £20,000,000 and £30,000,000. The original scheme has been revised, and it is hoped that all details will be completed in a few months' time.

Telegraph and Telephone Notes.

Australia.—NEW RADIO RECEIVING STATION.—The La Perouse radio receiving station was opened recently by Amalgamated Wireless (Australasia), Ltd. It is capable of receiving messages from Tilbury Docks, London, as well as from the docks in Vancouver and San Francisco, and has also kept in communication with ships fitted with short-wave sets between these terminal ports. It will be the official receiving centre for Sydney, and will be in direct communication with all the "beam" feeder stations in Australia, and will automatically relay the messages received direct into the head office of the company. The same procedure will be followed regarding messages received from the Federal Government stations in New Guinea and the Pacific Islands, which are controlled by Amalgamated Wireless, Ltd. All transmitting will be done from the Pennant Hills centre, about 30 miles distant. The aerial system at La Perouse consists of four 72-ft. tubular steel masts in the form of a square, with one 99-ft. mast in the centre, and land-line connections have been installed between La Perouse and the General Post Office, Pennant Hills, and the head office of Amalgamated Wireless, Ltd.

Spain.—MADRID-ARGENTINA WIRELESS SERVICE.—At a meeting on March 23rd, the Cabinet approved of the establishment of a public wireless service between Spain and Argentina.—*Reuter* (Madrid).

Turkey.—AUTOMATIC TELEPHONY.—We have been requested to state that the automatic telephone exchange at Angora was delivered by the Telefonaktiebolaget L. M. Ericsson, of Stockholm, and not by an American company, as reported some time ago. The network was installed by a private Turkish company.

United States.—NEW YORK TELEPHONE PROGRESS.—President J. S. McCulloh, of the New York Telephone Co., reviewing the achievements of his organisation during the past year, says that more than $78,000,000 was invested in 1926 to enlarge its system in New York State, northern New Jersey, and a small portion of Connecticut. Nearly $41,000,000 went for necessary expansion of the system in New York City. A total of 174,200 telephones was added during the year to the system, which now serves over 2,600,000 telephones, of which nearly 1,520,000 are in the five boroughs of New York City. The volume of local calls handled in the company's entire territory increased during the year from approximately 9,568,000 to about 10,288,000 per day. Toll and long-distance calls increased from 773,500 to 881,900 daily.

Radio Notes.

Australia.—ROYAL COMMISSION.—The Royal Commission on Wireless, which has been appointed by the Government, met for the first time on February 7th, and the first public meeting took place on February 9th in Melbourne. The Commission is hearing evidence in the capital city of each State.

Continental Relays.—PROPOSED EXCHANGE OF PROGRAMMES.—Although the B.B.C. receiving plant at Keston relays American stations on Tuesday nights, Continental relays seem to have gone out of fashion in this country; yet it appears that they are finding favour abroad, for the *Evening News* reports that the so-called "rapproachment" sub-committee of the Office Internationale de Radiophonie recently met at Vienna to discuss the exchange of broadcast programmes by wireless link.

Denmark.—REDUCTIONS IN LICENCE FEES.—The fee for a receiving licence has been reduced to 10 kr. for crystal as well as for valve sets; it formerly cost about 12s. 6d. for crystal and 15s. for valve sets. *World Radio* says that listeners in Denmark, on February 1st, reached a total of 130,446, of which 64,231 were crystal listeners and 66,215 valve listeners. The licence for receiving apparatus with loud-speaker for use in public places has been reduced from £25 to £10 yearly. The new high-power station will be ready in July.

France.—NEW REGULATIONS.—All radio stations in France are now under the general administration of the Post, Telegraph and Telephone Service and the Ministry of the Interior. Private stations which receive communications other than private correspondence can be authorised by special agreement, the details of which are to be determined by decree, and after the payment of an "art tax" at rates to be determined. Places which charge for admission are, in addition, subject to an annual tax, which is also to be determined by decree. Private sending stations or receiving and sending stations may be established only by special authorisation of the Ministers of War, Marine, Interior, and the Post, Telegraph, and Telephone Service, with the consent of an interministerial committee. Three national and 18 regional establishments will be set up either under direct Government operation or by special concessionaires; the programmes will be under the charge of special groups approved by Government authorities. For the present it is intended that the Post, Telegraph and Telephone Service shall secure the co-operation of private groups, which will assume the financial burden of operating the large sending stations; a year hence the Government authorities will have the power to enter into contracts with private interests which shall run not longer than to January 1st, 1933, for the establishment and operation of the proposed stations. The concessionaire is to pay a tax, and the capital invested is to receive a dividend not greater than the interest on the advances of the Bank of France to the State, plus 2 per cent.; after charging 10 per cent. to amortisation and payment of dividends, the surplus profits are to be divided equally between the Government and the concessionaire. At the end of the contract period the operating authority becomes the owner of the properties subject to paying the non-amortised capital cost within five years. In spite of declarations by the Government that the new regulations do not contemplate nationalisation, they contain the possibilities of very strict Government control. Private radio equipment of all sorts is to be operated only by special permission; its use may be stopped at any time on the vote of a Government commission. Free access to the markets of the world is limited in the case of both public and private sending stations by the requirement that such equipment "must be as far as possible of French manufacture." A commission of 44 members, 22 of whom are to be Government officials, is to advise on all subjects covered by the decree or delegated to them by the ministers. According to *Commerce Reports*, one of the objects is to "establish a coherent, rational, and powerful" system which can combat foreign propaganda through the dissemination of French ideas.

Greece.—NEW STATIONS.—The construction at Athens of a new transmitting station by the Administration of Posts and Telegraphs is actually completed. With a view to choosing its wavelength, the station is now proceeding to make tests. According to *World Radio*, other stations are to be constructed at Janina, Patras, Syra, Zante, and Chio.

Irish Free State.—CORK STATION.—The new broadcasting station at Cork of the Department of Posts and Telegraphs, constructed by Standard Telephones & Cables, Ltd., London, has almost completed its tests. It is located at Sunday's Well, and occupies the site of the old prison. Two 120-ft. masts support the aerial, which consists of four wires each 156 ft. long; an earth mat, composed of a network of copper wires, has been buried in the ground covering an area of approximately 20,000 square feet. The station is rated at 1.5 kW, which means that 1.5 kW is given to the oscillators, which in turn deliver 1 kW of unmodulated power to the aerial system, so that with 100 per cent. modulation a "peak" power of 4 kW can be handled without distortion, assisted by the use of a condenser microphone. Standard Telephones & Cables, Ltd., with its associated companies, has constructed some 38 broadcasting stations of a similar size. The frequency of the carrier wave is maintained constant within 0.01 per cent. The power required to operate the complete station is about 9 kW, obtained from the local supply mains and used to drive motor generators. It is hoped that this station will cover the south and west of the Free State, and the *Irish Times* is informed that it is hoped formally to open the station on the 25th proximo. Arrangements are in hand for the fitting up of a suitable studio and necessary office accommodation in the station premises. The wavelength is 400 metres. One programme only will be given from both the Cork and Dublin stations, trunk telephone lines being used to connect the two studios.

South Africa.—NEW COMPANY.—The African Broadcasting Co. has been registered with a capital of £50,000 to broadcast throughout the Transvaal, and ultimately Rhodesia and Mozambique. According to the *Financial News*, the Government has two directors on the board of the company, which was promoted by Schlesinger.

Spain.—REGIONAL CONTROL.—Two more stations, Radio San Sebastian (EAJ8) and Radio Salamanca (EAJ22) have been taken over by the Union Radio, the object being to endow Spain with a regional service, so as to enable listeners on crystal sets to enjoy a variety of programmes.

United States.—NEW RADIO LAW.—The failure of the United States Senate to confirm the nomination of two of the five men selected by President Coolidge to be members of the new Federal Radio Commission has been followed by the President making "recess" appointments of the two men in question, says *World Radio*. The Board is handicapped, since the Deficiency Bill, which authorised $120,000 for salaries and other expenses, failed to pass before Congress adjourned. Mr. Herbert Hoover, Secretary of Commerce, is co-operating with the Commission in its efforts to function. The main problems before the new body just now are overlapping and heterodyning.

Wave Propagation.—EFFECT OF RECEIVING AERIALS.—Mr. R. H. Barfield, of the Radio Research Station, Slough, recently estimated the extent to which a large number of receiving aerials contribute to the absorbing effect of the earth's surface on wireless waves in resonance with them.

Calculation showed that, with a density of aerial distribution such as now exists in an urban district surrounding a local broadcasting station, the energy absorbed by the aerials should be the decisive factor in determining the surface attenuation, and experiments have yielded results that constitute very definite evidence of a critical effect of large magnitude occurring at or near the resonant wave-length, the phenomenon appearing only ascribable to the selective action of the multiplicity of tuned aerials in the path of the waves. Thus, at Slough an increase in intensity of the order of 90 per cent. was observed for a variation in wave-length of only 5 per cent.; while for a wave-length change of 120 metres a total increase of field strength of nearly five to one was obtained; that is, for a given power transmitted, the received power increased more than twenty-fold. It is explained in *Nature* that the hypothesis that this effect is mainly due to the transmitted waves passing in and out of resonance with the aerials in their path is confirmed by the fact that the effect was found to increase in proportion to the distance which the waves travelled over crowded residential districts, and was negligible when the wave path lay almost entirely over open country with only a small residential area round the transmitter; the hypothesis was further confirmed by the fact that the effect was shown not to be peculiar to a given transmitter or receiving site. On the other hand, it seems at first to be contradicted by the fact that the minimum intensity, and therefore apparently the maximum absorption, does not occur at the resonant wave-length, but at a wave-length considerably below: in some cases the minimum had not been reached at 300 metres, below which wave-length experiments have not yet been carried. A brief study of the theoretical side of the problem, however, shows that this is not necessarily the case. The observations on which the above note is based were carried out as part of an investigation for the Radio Research Board of the Department of Scientific and Industrial Research.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—May 10th. Postmaster-General's Department. Telephone relays. (B.X. 3333.)*
May 17th. Resistances and reactances. (B.X. 3307.)*
May 23rd. State Electricity Commission. Switchgear and accessories. (B.X. 3285.)*
May 9th. 6,600-V transformers and spares. (B.X. 3331.)*
July 5th. One 15,000-kW steam turbo-generator and accessories. (B.X. 3369.)*
Sydney.—May 9th. Electricity Department. Station auxiliary switchgear. (B.X. 3338.)*

Ayrshire.—Education Authority. Electric lighting and central heating installations for the addition to Ardeer public school. Mr. J. E. Shaw, clerk, Education Offices, Ayr.

Barnes.—Electricity Department. 1,200 yd. l.p. armoured multiple cable. (See this issue.)

Barking.—May 9th. County of London Electric Supply Co., Ltd. Cables and accessories for the Barking power station. (See this issue.)

Beckenham.—April 4th. Electricity Department. Three e.h.p. transformer sub-station switchboards. (March 18th.)

Belfast.—April 7th. Electric lighting and power installations at New Museum and Art Gallery, Botanic Gardens Park. Town Clerk's office, City Hall.

Bolsover.—April 19th. Urban District Council. Cables, boxes, pillars, &c. (See this issue.)

Bristol.—April 11th. Electricity Department. 39 miles (approx.) 3-core, paper-insulated cable. (March 18th.)

Clayton.—April 18th. Urban District Council. E.h.p. feeder cables, l.p. distributing mains, fuse pillars and transformer kiosk. (See this issue.)

Colombia. — Bogota.—April 30th. Ministry of Public Works. Two electric lifts. (A.X. 4433.)*

Edinburgh.—April 18th. Electricity Supply Department. De-aerating plant and boiler feed pumps. (March 25th.)

Grimsby.—April 2nd. Electricity Department. Deansgate balancer set, switchgear and cablework. (March 25th.)

India.—April 5th. India Store Department. 27,000 yd. paper-insulated armoured cable for telephones. (March 25th.)
April 26th. 66-kVA motor-driven alternator sets, transformers, switchgear, &c. (See this issue.)

Kilmarnock.—April 6th. Ayrshire Electricity Board. Two water-tube boilers, with superheaters, economisers, air heaters, mechanical stokers, and coal-handling plant. (March 18th.)

Leeds.—April 7th. Board of Guardians. Electrical wiring of certain blocks and electric bell installation at the Beckett Street Institution. Mr. J. Edwin Storr, consulting engineer, Midland Bank Chambers, 13, Bond Street, Leeds.

London.—Holborn.—April 13th. Board of Guardians. Electric lighting installation at the London Road, Mitcham, schools. (March 18th.)

London County Council. April 12th. Wiring and fittings for electric lighting for Everington Street School, Fulham (approx. 196 points). (See this issue.)
G.W.R. April 21st. Stores, including electrical wires and cables and telegraph ironwork. (See this issue.)

Middlesbrough.—April 8th. Electricity Department. 12 months' supply of cables and meters. (March 25th.)

New Zealand.—Wellington.—May 31st. Public Works Department. 50-kVA transformers for the Waikaremoana electric power scheme. (B.X. 3294.)* 50-kVA transformer for Arapuni scheme. (B.X. 3293.)*
June 7th. Railway sub-station equipment, Lake Coleridge electric power scheme. (B.X. 3295.)*
May 4th. General Post Office, Stores Division. Sub-station protectors. (B.X. 3286.)*
June 13th. New Zealand Railways. Machine tools, workshop equipment and overhead electric travelling cranes. (A.X. 4344.)*
June 6th. Six electric locomotives. (A.X. 4355.)* Overhead equipment for the Christchurch-Lyttelton electrification scheme. (B.X. 3301.)*
Invercargill.—May 21st. Southland Electric Power Board. Transformers. (B.X. 3379.)*
June 15th. 66,000-V, oil circuit-breakers. (B.X. 3378.)*

Plymouth.—April 25th. Electricity Department. Electricity meters, cables, and transformers. (See this issue.)

Southend-on-Sea.—April 9th. Light Railways and Electricity Department. Remote-controlled rotary convertors. (March 11th.) April 19th. 4,000 joint boxes. (March 25th.)
April 19th. 1,400 current limiters. (See this issue.)

Uruguay.—Montevideo.—June 15th. State Electricity Supply Works. 15 transformer sub-station equipments (6,600/220 V, 50 cycles). (B.X. 3371.)*

Wrexham.—April 19th. Electricity Department. One 250-kW rotary-convertor equipment and d.c. switchgear. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Sydney.—Electricity Supply Committee. Recommended:—
Tungsten-filament electric lamps (£7,955).—Warburton Franki, Ltd.
33,000-V cable and pilot cable (£67,594).—British General Electric Co., Ltd.
H.p. and l.p. cables (£86,344).—Standard Telephones and Cables (Aust.), Ltd.
Outdoor automatic oil switches (£8,800).—English Electric Co. of Australia, Ltd.
Two 1,000-kVA transformers (Spec. 1,082) (£2,129); distribution transformers (Spec. 1,088) (£11,684).—Electrical Plant Manufacturers, Ltd.

MELBOURNE.—Electric Supply Committee. Accepted :—
30,400 yd. fibre conduit (£3,673).—Standard Telephones and Cables (Aust.), Ltd.
110 ornamental street-lighting units (£2,716).—Australian General Electric Co., Ltd.

BRISBANE.—City Council. Recommended :—
94 traction motors: 11 Metropolitan-Vickers Electrical Co., Ltd. (£2,706); 38 made in U.S.A. (£10,055); 45 ditto (65 per cent. made in Australia) (£11,925).—Australian General Electric Co., Ltd.
—*Tenders.*

Bexhill.—Electricity Committee. Recommended:—
Three feeder panels (£216 each).—Bertram Thomas.

Brighton.—Health Committee. Accepted:—
Installation of X-ray apparatus at sanatorium (£326).—Solus Electrical Co.

Dundee.—Electricity Committee. Accepted:—
Two boilers for Carolina Port electricity station (£36,589).—Babcock & Wilcox, Ltd.

Chester.—Corporation. Accepted:—
Supply and fixing of an electrically-driven pump at the junction of Appleyards Lane and Hartington Street (£298).—Pulsometer Engineering Co., Ltd.

Epsom.—Urban Council.
Wiring houses on the Horton site for electric light.—Mr. Pengilly (£2,083, accepted).

Hornsey.—Electricity Committee. Recommended:—
Stoneware troughs.—Doulton & Co., Ltd.
Cables.—Pirelli-General Cable Works, Ltd., and Standard Telephones & Cables, Ltd.
Six 4-way distribution boxes and six 6-way boxes (£324).—Motor Gear & Engineering Co., Ltd.
Extension of Hewittic set at Highgate sub-station (£1,244).—Hewittic Electric Co., Ltd.

Irish Free State.—Controller of Stores (Posts and Telegraphs) :—
Cable turning section and end panel.—Standard Telephones and Cables, Ltd.
Cables.—W. T. Henley's Telegraph Works Co., Ltd.
Heat coils.—Phœnix Telephones & Electric Works, Ltd.
Fuses.—International Electric Co., Ltd.
Telephone plugs.—Ericsson Telephones, Ltd.
Sections, switch, No. 9.—Standard Telephones & Cables, Ltd.

London.—METROPOLITAN WATER BOARD. Accepted :—
Four months' supply of "Siemens" gasfilled lamps.—Siemens & English Electric Lamp Co., Ltd.

LONDON COUNTY COUNCIL.—Education Committee.
Electric lighting installation at Barrett Street trade school.—Alpha Manufacturing & Electrical Co., Ltd.

METROPOLITAN ASYLUMS BOARD.—Installation of electric lighting at Millfields, Rustington, Littlehampton.—Alpha Manufacturing & Electrical Co., Ltd.

STEPNEY.—Electricity Supply Committee. Recommended :—
50 tons pitch (£262).—Smith's Tar Distillery, Ltd.
50 t.c.c. disconnecting boxes (£105).—Universal Electrical Manufacturing Co., Ltd.

Supply of cables for two years :—

W. T. Henley's Telegraph Works Co., Ltd. ...	£38,295
Hackbridge Cable Co., Ltd.	38,477
Macintosh Cable Co., Ltd.	39,057
Standard Telephones & Cables, Ltd.	39,059
British Insulated Cables, Ltd.	39,072
W. T. Glover & Co., Ltd.	39,111
Pirrelli-General Cable Works, Ltd.	39,348
Callender's Cable & Construction Co., Ltd....	39,370
Siemens Bros. & Co., Ltd.	40,175

London Midland & Scottish Railway Co.
Electric lamps for nine months.—Siemens & English Electric Lamp Co., Ltd.

New Zealand.—AUCKLAND.—Electric Power Board.
22,000-V cable from the Penrose sub-station to Auckland (£65,150).—Siemens Bros. & Co., Ltd.
—*Tenders.*

South Africa.—CAPE TOWN.—Electricity Committee. Accepted :—
20 tons hard-drawn bare copper wire (£1,584); 8 tons copper wire (£605).—British Insulated Cables, Ltd.

Recommended :—
Crane (£162); paper-insulated cable (W. T. Glover and Co.'s manufacture) (£197).—Davis & Soper, Ltd.
Transformer (£110).—S.A. General Electric Co., Ltd.
Extensions switchboard, Burg Street (£171).—A. Reyrolle & Co., Ltd.
Two switch panels in connection with the electrification of Brackenfell quarry (£224).—British Thomson-Houston Co., Ltd.

Stoke-on-Trent.—Stores Purchasing Committee. Accepted :—
Electric lamps.—Blackburn, Starling & Co., Ltd.; Barnett, Soans & Gould; Robinson & Hands Electrical Co., Ltd.; H. W. Teeton; Hawley & Ingram; and Potts & Co.

Electricity Committee. Accepted :—
De-aerating plant at central power house (£1,581).—Hick, Hargreaves & Co., Ltd.

Boiler and feed pumps (£1,716).—G. & J. Weir, Ltd.

Supply of cables and laying mains for the year.—Callender's Cable & Construction Co., Ltd.

Tynemouth.—Trade and Commerce Committee. Accepted :—
Wiring fish quay sheds for electricity (£145).—W. W. Ward & Son, Ltd.

Electricity Committee. Accepted :—
Cables (£128).—Edison Swan Electric Co., Ltd.

Forthcoming Events.

Institution of Engineers-in-Charge.—Saturday, April 2nd. Holborn Restaurant, London. 6.30 p.m. Annual dinner.

Salford Technical and Engineering Association.—Saturday, April 2nd. Royal Technical College. 7 p.m. "Electro-Deposition of Metals." Mr. E. J. Dobbs.

Society of Engineers.—Monday, April 4th. Burlington House, W. 5.30 p.m. "Some Aspects of Reinforced Concrete." Mr. G. C. Workman.

Röntgen Society.—Tuesday, April 5th. 32, Welbeck Street, W. 8.15 p.m. Ordinary meeting.

Association of Supervising Electrical Engineers.—Tuesday, April 5th. Junior Institution of Engineers. 7.15 p.m. "Lighting of Small Towns." Dr. J. A. Purves.

Institution of Electrical Engineers.—Thursday, April 7th. London. 6 p.m. "The Number of Tests required to establish the Rupturing Capacity of an Oil Circuit-breaker." Messrs. W. B. Whitney, C. E. R. Bruce, and E. B. Wedmore.

(Wireless Section).—Wednesday, April 6th. London. 6 p.m. "Battery Eliminators," by Messrs. P. R. Coursey and H. Andrewes.

(North Midland Centre).—Tuesday, April 5th. Hotel Metropole, Leeds. 7 p.m. Annual general meeting.

(North-Western Centre).—Tuesday, April 5th. Engineers' Club, Manchester. 7 p.m. Annual general meeting. "The Stability of Large Power Stations." Mr. F. H. Clough.

Women's Engineering Society.—Friday, April 8th. 26, George Street, W.1. 6.30 p.m. "A Business Woman's Trip to America." Miss E. M. Kennedy.

Institutions of Civil, Mechanical, Electrical, Municipal and County, and Locomotive Engineers (Yorkshire Sections).—Friday, April 8th. Great Northern Hotel, Leeds. Joint delegation dinner.

Junior Institution of Engineers.—Friday, April 8th. 39, Victoria Street, S.W. 7.30 p.m. "Electrical Osmosis." Mr. E. Ambrose.

Royal Institution.—Friday, April 8th. 9 p.m. "Early Days in Radio Activity." Sir Ernest Rutherford, F.R.S.
Saturday, April 9th. 3 p.m. "Alpha Rays and Atomic Structure." Sir Ernest Rutherford, F.R.S.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, April 9th. At the School of Mines, Treforest. 6 p.m. "Aerial Wire Ropeways." Mr. J. W. White.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

VITRITE insulating material for lamp caps.

Notes.

The Batti-Wallahs' Society.

On Tuesday last week, at the Hotel Cecil, the Society celebrated its 21st birthday by converting the annual dinner into a dinner-dance, and the experiment proved so popular that it will probably have to be repeated. No outstanding guests of honour were there, but Mr. President A. W. Blake and Mr. Vice-President G. W. Partridge presided over a jolly gathering of some 200, which included a number of ladies and gentlemen famous in the electrical industry.

We recently received a neat little brochure recording the history of the Society, which derived its origin from a suggestion by Mr. L. M. Waterhouse in 1905, that old P. & O. Batti-Wallahs should band together.

Telephone Insurance.

What is claimed to be the first insurance concern in the world specialising in the insurance of private telephone installations against damage and breakdown has recently been formed in Berlin, with a capital of £20,000, and the title of the Tela Versicherungs Gesellschaft für Technische Anlagen.

Illuminated Road Signs.

The accompanying illustration shows day and night views of one of a number of road signs of the Hendon Urban District Council which have been illuminated. Tests carried out at night showed that the illuminated sign could be distinguished easily 500 yards away in clear weather, and 200 yards away in fairly heavy fog. A 20-W red-sprayed

An Illuminated Road Sign: Day and Night Aspects.

"Osram" sign-type lamp is fitted at the apex of the red triangle, and a 20-W squirrel-cage vacuum lamp, with a special vitreous-enamelled-steel dispersive reflector supported by a bracket, is centrally fitted below the base of the triangle in order to direct a beam of concealed light on to the actual character and wording of the sign. A standard G.E.C. 1.5-A time switch controls the lamps, lighting and extinguishing them at predetermined times automatically without any attention except winding once a fortnight. At each winding the switch is reset to operate the lamps at times coinciding with the lighting-up regulations. The installation was designed by the General Electric Co., Ltd.

Faraday House Old Students' Association.

The Association's function this term took the form of a dance, held in co-operation with the Faraday House Rugby Club, on March 18th, and was well supported by old students, who represented practically every branch of the electrical world. Dancing continued until midnight, with a short interval for a humorous entertainment provided by the well-known artistes, Robert Pitt and Langton Marks. Amongst those present were Mr. J. F. Watson, of Messrs. Callender's Cable and Construction Co., Ltd., president of the Association, Dr. Alexander Russell, and Mr. Michael Terry, F.R.G.S., the well-known explorer. This was the Association's first dance, and those present unanimously agreed to make it an annual function.

Service Notes.

Royal Air Force.—The British War and Victory Medals of a large number of ex-officers and ex-airmen still remain to be issued, despite the efforts made to distribute them. The Air Ministry appeals to ex-Service *personnel* entitled to them to apply at once and give the necessary information.

The Air Ministry announces that a considerable number of short-service commissions will be granted in July, and it is prepared to consider applications now from candidates between 18 and 25 who wish to fly. The officer who, after five years' service in the Air Force, reverts to civil life will, if he has taken advantage of the facilities provided for him, find himself well qualified to obtain civil employment. Applications for forms and regulations should be addressed to the Secretary, Air Ministry, Adastral House, Kingsway, W.C.2.

Some Problems in Illuminating Engineering.

The last meeting of the Illuminating Engineering Society, which was held at the Lighting Service Bureau, London, on March 22nd, was devoted to the discussion of a series of problems in illuminating engineering, briefly introduced by various speakers.

The first item was a contribution from Mr. L. M. Tye, who described the lighting of the Greyhound Theatre and Dance Hall at Croydon, as an interesting example of decorative lighting. The installation had to be so designed that the dance hall could be changed over to a theatre or concert hall in 15 minutes. A panelled partition was provided between the dining room and the new interior, so that independent entertainments could go on simultaneously. The interior can also be used for kinema displays, and the system of lighting is both flexible and decorative. The general lighting is indirect, and is furnished by a very large central fitting. A feature is the equipment of this fitting with supplementary Holophane colour-units to be used on festive occasions: special battens, spot-lights, &c., for the stage-lighting are also provided, and the whole equipment forms a striking instance of the use of light to enable the proprietors of hotels to provide attractive entertainments, as well as to dispense meals.

Mr. W. Millner described the lighting installation in the Cathedral of St. Sophia, London, of which an account appeared in the Electrical Review of November 19th, 1926.

The next problem, the lighting of a greyhound racing track, was dealt with by Mr. H. H. Long, who pointed out the difficulty of furnishing adequate illumination and at the same time avoiding glare in the eyes of spectators. This is effected by mounting a series of projectors along the outer edge of the track only three feet above the ground, the beam being in each case slightly depressed and projected inwards on to the centre line of the track, in the direction of the racing.

Mr. J. S. Dow presented a simple problem in railway lighting due to Mr. A. Cunnington (Southern Railway). At a suburban station it had been found that engine drivers found great difficulty in identifying the distant signals when approaching the platform. The trouble was traced to the glare caused by exposed lamps along the platform, and after new reflectors for screening the mantles had been substituted there was no further trouble. Mr. Dow also gave a summary of recent attempts to improve the efficiency of optical lanterns and kinema projectors, raising the problem whether it was possible, by any arrangement of lenses or mirrors, to produce an image brighter than the source of light. It would be observed that this might require the utilisation of only a small fraction of the original light emitted, if the image were small; but possibly there was some fundamental thermodynamic reason why this could not be done.

Mr. L. E. Buckell raised several interesting problems in connection with the use of coloured light, Mr. S. G. Elliott discussed various problems met with on the underground railways, and Mr. G. Herbert described the method of lighting the gardens at the Ideal Home Exhibition. It was announced that the next meeting, in April, would be held at the National Physical Laboratory.

The Shannon Power Scheme.

Mr. McGilligan, Minister for Industry and Commerce for the Irish Free State, speaking on the second reading of the Electricity (Supply) Bill, said that the Shannon scheme was projected to supply electricity to all towns and villages of 500 population and upwards in the State. Actually it would not do so—there was a certain number of small towns left out. Taking the most up-to-date returns, there were 225 towns of 500 population and upwards, and the total was 1,135,000 people. At present there were 20 statutory undertakings, and over 90 non-statutory or unauthorised undertakings. Of the 20 statutory undertakings, five were privately owned, and 15 were under the control of municipal authorities. The five privately-owned served a population of about 109,000, and the 15 municipal undertakings supplied about 502,000 people. Of the 90 non-statutory undertakings, 12 were situated in places of less than 500 population and were left out of the calculations; the 78 remaining were in areas with a total population of some 164,000. Areas of 500 population in the country without electricity supply had a total population of about 264,000. The position with regard to the whole Shannon undertaking was that in about 1929, under ordinary conditions, the annual consumption of electricity in the country would be seventy million units, and the problem was to make that remunerative at the experts' price based on 110 million units.

Appointments Vacant.

Shift engineers for the Newcastle-on-Tyne Electric Supply Co., Ltd. Two shift engineers for the Park Royal Hospital, N.W.10. Junior shift engineer for the Kingston-on-Thames Electricity Department. (See our advertisement pages to-day.)

High-Pressure Steam Turbines.

A steam turbo-plant installed at the Langerbrugge power station of the Centrale Electrique de Flandres (Belgium), by the Brown-Boveri organisation, utilises the high initial steam pressure of 710 lb./sq. in. gauge, superheated to a temperature of 830 deg. F. The present installation, which has been in service for over a year, consists of a 1,750-kW primary turbine, designed for the above inlet steam pressure. In passing through the turbine the steam is expanded down to a gauge pressure of 285 lb./sq. in., and is then led to a 6,600-kW low-pressure set. The operation of this plant has been so satisfactory that an order has now been received for extensions. The output of the new primary turbine will be 6,000 kW, the steam conditions being exactly the same as for the original plant. The new set will deliver steam to three additional low-pressure sets.

In this installation full use is made of the fact that with high-pressure plant the advantages of feed-water heating can be carried much further than with low pressures, and in this case the feed water is pre-heated to about 390 deg. F. By the use of such high-pressure steam the overall efficiency of the plant is considerably increased.

Coventry's New Electricity Works.

Good progress is being made with the preliminary works of the new electricity station which the Coventry City Council is establishing at Foleshill. Levelling and excavations are proceeding on a 53-acre site adjacent to the Oxford canal, by which the works will be served, and there will also be a siding to connect with the Nuneaton and Coventry branch of the L.M. & S. Railway. A contract running beyond £500,000 is being carried out by the British Thomson-Houston Co., Ltd., Rugby, for the buildings and equipment for generating 37,000 kW, and the station will be capable of extension to an ultimate capacity of about 100,000 kW. The cables, &c., are expected to cost another £200 000. In the vicinity of the site was formerly a colliery, which many years ago was closed down in consequence of an underground fire, and has never been re-opened. There is plenty of water in the coal seams, and boring is taking place to reach it, as the new station will require 40,000 gallons per hour for cooling purposes. This supply will be supplemented from a stream which runs through the site, and arrangements may, perhaps, be made for using water from the canal.

Teachers in Technical Institutions.

The annual conference will be held this year at Plymouth, from Friday, June 3rd, to Tuesday, June 7th. The provisional programme includes, in addition to the business of the conference, a number of visits, moorland and sea excursions, and an educational and industrial exhibition in the Guildhall from June 4th to 10th inclusive.

Electric Vehicles in New York.

More than 2,000,000 loaves of bread are consumed daily in the Metropolitan section, it was estimated recently on the completion of the New York Edison Company's survey of bakeries using electric trucks, the results of which were made public at the seventh annual Electric Truck Show in the Company's showroom. The survey showed that fifty bakeries in the Metropolitan district employ a total of 1,271 electric trucks, and that they carry between 1,200 and 1,500 one-pound loaves apiece at every load. Bakeries use more electric trucks than any other single industry in Greater New York, it was found; transportation companies are next, thirty companies employing 797 "electrics"; and the fifty-six provision companies that use 580 "electrics" come third. New York's big stores together employ 571 electric delivery trucks, the last horse in the service of any big store having been ousted a year ago. In Manhattan and The Bronx alone, 352 companies employ a total of more than 3,500 electric trucks.

A miniature 2-passenger electric roadster weighing only 200 pounds, which has a 62-inch wheelbase and will run at ten miles an hour, was introduced to the public at the Show. It is designed for practical service in the city or country. The chassis is of the buckboard type, with ash slats, and the wire wheels are fitted with over-size pneumatic tires. An electric motor similar to the starting motor of a gasoline automobile drives the rear wheel by a gear train. The standard storage battery will drive the car from twenty to thirty miles, depending on the road, on a single charge. Foot pedals are used to operate both the emergency and service brakes, and also the 2-speed motor control. The roadster is equipped with head and rear lights, a standard size electric horn, and a device which cuts off the supply of electric current and locks the emergency brake.

Two double-headed electric fire and "wrecking" trucks, with drivers' seats, steering apparatus, and "wrecking" cranes at both ends (so that they can be run backward or forward equally as well) are to be used for safeguarding the traffic in the new Holland vehicular tunnel, for removing disabled automobiles from the tunnel, and in emergencies of all kinds. They have been specially designed for working in the limited space available in the tunnel, and will carry a crew of seven men in addition to the chauffeur. For fire fighting the trucks will use chemical "foam" apparatus, connected with the tunnel's water supply, with ladders, portable inhalators for resuscitating those overcome by smoke or fumes, gas masks, electric lanterns and searchlights for penetrating smoke, as well as first-aid equipment, &c. In addition, a tower and pump wagon will be used for tending the lights in the tunnel, which will be 12½ ft. above the roadway, and also the lights on the plazas, 24 ft. above the street; it is equipped with a mechanical elevating tower operated by a motor from the storage battery in the truck. It will also carry 250-gallon per minute and 30-gallon per minute rotary pumps for removing the seepage of the tunnel collected in the sumps; the 30-gallon pump also will be electrically operated from the storage battery. A standard 2-ton utility truck will be used for hauling purposes in the tunnel work. The manufacture of the trucks is now being completed by the Commercial Truck Company, Philadelphia.

The Piezo-Electric Effect in Rochelle Salt Crystals.

Although the piezo-electric effect in Rochelle salt crystals cut normal to the *a* crystallographic axis has been studied, the only work on plates normal to the *b* and *c* axes consists of some old measurements by Pockels at room temperature. Plates were cut from a large crystal perpendicular to each of the three crystallographic axes. Electrodes of tinfoil were attached by means of Canada balsam and pressure was applied at 45 deg. to the axes in the plane of the faces on which the charges produced were measured. The changes in the values in the *b* and *c* directions per degree rise in temperature were found to be very far less than in the *a* direction. It was found, moreover, that the electrical anomalies, such as fatigue, hysteresis, and residual charges, were relatively much smaller in the *b* and *c* directions. Although the crystal cut normal to the *b* direction is much less active than one cut normal to the *a* direction, the absence of these irregularities and of the large temperature coefficient just above ordinary room temperature would make the crystal cut in this way more useful in practical applications of the piezo-electric effect. It is still about twenty times as active as quartz.—Joseph Valasek, in *Science*.

A Street-Lighting Tower Wagon.

A somewhat unusual electric tower wagon has recently been put in service by the electrical department of the Lynn Gas and Electric Co., of Lynn, Mass., U.S.A., for the maintenance and trimming of the electric lamps used for public street-lighting purposes in that city. The service extends over an area of 26½ square miles, in which a total of 767 lamps have to be periodically attended to, 268 of the lamps being of the arc type and the remainder incandescent. The arc lamps are suspended at a height of from 19 to 22 ft. above the ground, and the incandescent ones from 16 ft. upwards. Formerly maintenance was carried out with the aid of a horse-drawn tower wagon by means of which a couple of men were able to deal with 35 lamps only in a working day of eight hours, whereas with the electric vehicle sixty lamps are now being dealt with in the same time. The new vehicle is a standard one-ton electric truck fitted with a tower of light steel construction; the platform, in its folded-up and lowered position, is 13 ft. above the ground. The raising and lowering gear of the tower is electrically operated and so arranged that it can be locked at any point up to a maximum height of 17 ft. The platform is mounted on a turntable and is provided with folding sides and also with a folding sub-platform 2 ft. higher than the main one, enabling the two workmen to deal with lamps up to a height of over 19 ft. The chief novelty of the vehicle is the provision of two driving seats, one above the other, with duplex steering wheels and electric speed controllers, the upper steering wheel being 8 ft. above the ground, an arrangement which is claimed to have resulted in the saving of a considerable amount of time, inasmuch as the vehicle can be shifted from lamp to lamp without the driver, who is also one of the lamp trimmers, having to descend from the platform to the main driving seat. Spare lamps, materials, and also the necessary tools are carried in a small van body at the rear of the chassis. As a result of the satisfactory use of the first vehicle, the Lynn Co. has recently ordered a second outfit on similar lines, except that the tower platform will have minimum and maximum heights of 12 ft. 5 in. and 18 ft. 9 in., rendering the use of a sub-platform unnecessary. It will be recalled that at a recent I.E.E. meeting, Mr. H. T. Harrison advocated the use of such vehicles in this country.

Electrical Refrigeration.

The last E.D.A. salesmanship conference of the session was held on March 18th. Alderman Sir Duncan Watson presided, and Mr. N. E. Barber repeated the paper which he recently read at Newcastle (*vide* ELECTRICAL REVIEW, February 4th, p. 195). The discussion which followed consisted mainly of questions. Mr. R. Wilson asked Mr. Barber if he had ever known a non-hermetically sealed machine which had caused illness or death through leakages of SO_2. Mr. Harwood emphasised the necessity for silence in operation, particularly in the case of domestic plant. That, he presumed, depended upon the speed of operation. Mr. Hughes asked within what limits automatic control should operate. He also asked what were the possibilities with regard to the use of a vacuum as an insulating medium. Mr. A. H. Morris asked for information as to the relative costs of the various apparatus. He believed the apparatus known as the "ice

stove," which could be heated electrically or by gas, and had no moving parts, was sold at a price far below that of other refrigerators. Mr. W. Ritchie asked by what method Mr. Barber would adapt the average pantry as a refrigerating chamber, and how the cost would compare with that of a self-contained machine.

Mr. Barber said that he had never heard of a death resulting from a leakage of SO_2 or other refrigerant. He agreed that refrigerating machines should run silently, and in this respect the manufacturers of electric motors and drives could help a great deal. A moderate-speed motor was required. The limits of control depended upon the duties put upon the refrigerators. If automatic control were used he believed that, generally speaking, 3 degrees tolerance—say 2 up and 1 below—could be regarded as quite close commercially, and, provided the maximum was within the safe conservation temperature, he did not think it mattered very much if it were 5 or 4. He did not know that the use of a vacuum for insulation purposes had been seriously attempted on a commercial scale. He considered that its use would increase the price. The every-day universal types of machines cost much about the same, taking everything into consideration. The pure absorption machine was quite a cheap machine to make and sell, but not to run. There were a number of automatic and semi-automatic absorption machines of British and Continental makes, but they all suffered from the disability of high running costs. There was not very much difference in the cost of providing an independent refrigerator and that of insulating an existing site. The insulated site was superior from the point of view of utility and thermal efficiency, and, consequently, running cost, but it had to be borne in mind that if a pantry were insulated the insulation was a fixture and became the property of the landlord.

Alphabet-itis.

Electrons, saucy little devils,
Were wont to find their proper levels
When Mr. Hildebrand de Vere,
The great consulting engineer,
Arrived upon the scene to test,
With megger, slide rule, and the rest.
They used to shiver in their shoes;
He'd deal with them just as he chose.

I'm speaking now of early days
Before he fell on evil ways,
When scarcely any of those letters
By which we recognise our betters
Adorned his name: a mere "C.E."
And perhaps an *M.A.O.F.B.*
(Indeed, he hadn't paid his "sub."
As member of the Mustard Club.)

But speedily the craving grew
To add initials to those few
Which once had been his modest pride.
He sought for honours far and wide;
He grabbed a wandering O.B.E.,
And bought a Hollywood degree;
He even added to his hoard
The index letters of his Ford.

His business card became too small
To accommodate it all,
And so he had a folder printed,
And to his clients more than hinted
That they'd find it well worth while
To mount it in a loose-leaf file:
"I haven't half exhausted yet
The glories of the alphabet!"

With each accretion to his name
Electrons shy more shy became;
They shrank abashed, they hardly dared
To show themselves. And when they heard
That he'd become *Sir* Hildebrand,
They said: "It's more than we can stand.
We cannot face this super-man;
His title, and his caravan
Of dazzling letters strike us dumb;
His trailing clouds of glory numb
Our every function!"

And the fact is
The great de Vere has lost his practice:
When he appears the news goes round,
And all electrons go to ground;
Of all his tests there's not one worth
A guinea—for they're all *Dead Earth*!

H.R.T.

Ceiling Fans.

The comparison of ceiling fans on the basis of air displacement is useless unless the measurements have been made under similar conditions. There appear to be practically no data published dealing with such conditions; experiments described in a paper by Messrs. E. Hughes and W. G. White, published in the March issue of the I.E.E. *Journal*, were carried out at the Municipal Technical College, Brighton, for the purpose of determining the factors upon which the measured volume of air depends. In the Electrical Review of January 18th, 1924, Mr. R. O. Kapp gives curves of air velocity measured in four directions at right angles to one another, and suggests that more consistent measurements of air velocity can be obtained by placing the fan at the top of a metal chimney 15 ft. square and 10 ft. high, having an opening about 2 ft. high at the lower end to allow circulation of the air. Such an arrangement, Messrs. Hughes and White maintain, has the disadvantage that the fan is working under artificial conditions and is not allowed to set up the kind of draught that may be peculiar to the design of its blades; the screen eliminates any induced draught, whereas the latter forms a large percentage of the total volume of air circulating normally. The conclusions arrived at may be stated as follows:—

(1) The air velocity decreases rapidly on the outskirts of the draught cone, especially immediately below the blade tips.

(2) The further the plane of observation below the fan, (*a*) the flatter is the velocity curve; (*b*) the nearer to the axis of the fan is the point of maximum velocity; (*c*) the more difficult it is to determine reliably the air velocity on the outskirts of the draught cone, and (*d*) the greater is the volume of air in circulation.

(3) A plane 3 ft. below the blades is the most representative position for taking air measurements.

(4) Calculations from velocities measured at 4-in. radial intervals have been found satisfactory, especially at a distance of 3 ft. below the fan; this distance is recommended as the largest interval consistent with reasonable accuracy.

(5) Owing to the rapidity with which the velocity falls off under the blade tips, it is important to have a rigid support for the anemometer so that its position may be set accurately.

(6) The volume of air circulated by a given fan is greater in a small room than in a large one; and it is suggested that a clear floor area extending 10 ft. in every direction from the axis of the fan should be provided.

(7) The draught is symmetrical in all directions so long as the space in the neighbourhood around the fan is free from unsymmetrical obstables.

(8) The air volume measured 3 ft. below a fan is independent of the height of the blades above the floor so long as that distance is not less than 8 ft.

(9) When the fan is close to the ceiling, there is a reduction in the air volume; but there is no gain from increasing the distance between the blades and the point of support beyond 3 ft.

(10) For a given fan speed, the volume of air is greater the higher the temperature of the room; consequently the room temperature at which air measurements have been made should always be specified.

(11) The quantity of air delivered by a ceiling fan is approximately proportional to the speed, but the spread of the draught is greater the higher the speed.

(12) If the fan be designed for its best operation at about its rated voltage and frequency, an appreciable departure from these values has very little effect upon the efficiency.

(13) With certain types of blades, an improvement in the efficiency can be obtained by tilting the blades upwards; this alteration, however, has the drawback of detracting from the æsthetic appearance of the fan.

Galvanised-Steel as Neutral Conductor.

An interesting problem in connection with the supply of electricity in rural areas has recently been introduced in France, where a syndicate of communes in the West decided to use galvanised-steel for the neutral wire of a l.p. distribution system. One supply undertaking refused to supply the system and the matter was brought to the notice of the local electricity supply control authorities, and, in turn, the French Ministry of Public Works. The opposition of the electricity supply undertaking was of a technical character, it being urged that the security and safety of the distribution system rested entirely on the continuity of the neutral wire, and that with galvanised-steel wire, it being liable to rust after several years' use, there was a risk of fracture at any of the branching points which it would be impossible to detect. The local authorities pointed out that the specification of the installation provided for many "earths" of the neutral wire, and that the regulations required that in all interior installations the neutral should be connected to earth. Under such conditions the accidental rupture of the neutral at one point ought not to bring the distribution system into danger, seeing that there would be numerous earth connections on both sides of the fractured wire. The Ministry adopted the view of the local authorities, pointing out that experience with galvanised-steel wire, particularly in connection with the French telegraph system, and for the past twenty years in rural distribution systems in Alsace-Lorraine, had revealed no troubles that would justify a decision to prohibit the use of such wire. The Ministry therefore saw no reason to reject the proposal to use galvanised-steel wire in the rural system in question, particularly for the neutral line in star-connected three-phase systems. At the same time, the local electricity supply control authorities are to assure themselves that everything will be done from the technical point of view in order to reduce the risk of fracture to a minimum. The decision is regarded as one of considerable importance in connection with the large amount of work that is at present in hand in France in extending the supply of electricity in rural areas, the limited demand necessitating that the cost of installation shall be kept down to a minimum.

New Method of Studying Radio-Waves.

At a meeting of the Académie des Sciences, General Ferrie explained a method of studying the propagation of radio-telegraph waves at a height, which has been invented by MM. Idrac and Bureau. The method consists in suspending a small emission apparatus from two balloons at a height of 14 kilometres.—*Reuter's Trade Service* (Paris).

A Heat-Resisting Porcelain.

Commerce Reports states that a new ceramic material, related to porcelain, that is not damaged by temperature changes, is said to have been developed by F. Behneke, of Lubeck, Handelshof. The inventor states that the material can be heated to 700 deg. F., and immediately immersed in cold water without cracking. It has been stated that it will be extensively used in electric heating devices. The cost of production is but little more than for porcelain. Patents have been applied for throughout the world.

National Association of Supervising Electricians.

CHANGE OF NAME.—From to-day the new name of the above Association will be the Association of Supervising Electrical Engineers. The new name will more nearly reflect the qualifications and experience of the members and their duties, while it is generally agreed that the designation "electrician" as used in the early days has lost its significance. New rules will also operate from April 1st, under which the qualifications for membership have been strengthened, the number of years' experience for supervising and commercial engineers and foremen having been increased, in the former case to ten years and in the latter case to eight years, with minimum ages of 26 and 24 years respectively. Subscriptions have been reduced and will include the Association's monthly journal. The address of the Association and telephone number remain unchanged.

Meter Engineers' Technical Association.

ANNUAL MEETING.—The first annual general meeting of this Association was held at the Lighting Service Bureau, London, on March 24th, when the result of the ballot for the 1927-28 Council was announced, and the following declared elected:—Messrs. W. E. C. Alliss, E. Fawssett, C. H. W. Gerhardi, J. T. Haynes, E. W. Hill, F. C. Knowles, G. D. Malcolm, E. Mathews, A. Middleton, and G. F. Shotter. Messrs C. B. Green and W. Casson were elected auditors for the ensuing year, and revised rules were confirmed by the meeting.

The hon. treasurer's report for the year ended December 31st, 1926, was adopted; general meetings during the 1927-28 session will be held on Fridays in the fourth week of the month, and commence at 7 p.m. A short, but interesting, discussion on matters arising out of the papers read during the past session was opened by the President, during which many of the members present submitted their views on the various subjects dealt with.

Institution Notes.

Institution of Electrical Engineers.

INFORMAL MEETING.—At the informal meeting held on March 21st, Mr. R. J. Mitchell opened a discussion on "Domestic Electrical Refrigeration," Mr. J. W. Beauchamp being in the chair. Mr. Mitchell showed a number of lantern slides, which illustrated the construction of a popular electrical refrigerator, which he described in detail; and he also briefly outlined the principles of other types. The Act which came into operation at the beginning of this year, prohibiting the use of preservatives in foods, created a huge field for the sale of refrigerating machines, and he suggested that the possibilities of commercial and domestic refrigeration presented a very bright prospect for the electricity supply industry.

NORTH-MIDLAND CENTRE.—The joint delegation dinner will take place on April 4th; early application for tickets is requested. The annual general meeting will be held on April 5th, at the Hotel Metropole, Leeds, after which there will be a smoking concert. The ballot list for officers and Committee is as follows:—*Chairman*: J. Edwin Storr; *Vice-Chairmen*: F. S. G. Hinings, C. Nelson Hefford; *Hon. Secretary*: H. Cecil Fraser; *Committee* (five vacancies): H. G. Fraser, W. P. Bramwell, P. Maxwell, S. R. Siviour, W. F. Mylan, L. H. Roberts, C. A. Gillin, A. H. Horsfield.

The Institute of Metals.

The Institute expects to register its 2,000th member before celebrating its 20th anniversary next spring. The total is already over 1,800. The next election of members is due to take place on April 13th. Persons then elected will have membership till June 30th, 1928, and an extra copy of the *Journal* for one year's subscription.

The Institute has decided to compile a list of "trade alloys," together with particulars of their composition and uses, as well as the names of manufacturers or agents in Great Britain. Persons interested are invited to forward such particulars to the Secretary.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

It was announced this week that Mr. ARCHIBALD PAGE has been appointed chief engineer and manager to the Central Electricity Board.

We give, accompanying these notes, photographs of Mr. J. R. BROOKE, who, as announced in our last issue, has been

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Mr. J. R. Brooke, C.B.,
Secretary to the Central Electricity Board.

appointed to be Secretary to the Central Electricity Board, also of Mr. D. W. COATES, who has been appointed the Board's accountant. Mr. Brooke is the late Permanent Secretary

Elliott & Fry] *[London.*

Mr. D. W. Coates, C.B.E.,
Accountant to the Central Electricity Board.

of the Ministry of Transport, and Mr. D. W. Coates is a member of the firm of D. W. Coates, West, Grimwood & Co., chartered accountants. He was formerly Financial Secretary

of the Coal Mines Department and Chairman of the Financial Board of the Department. The offices of the Board will be at Trafalgar Buildings, 1, Charing Cross, S.W.1. The Minister of Transport has appointed Mr. C. W. Hurcomb, C.B., C.B.E., Principal Assistant Secretary of the Ministry of Transport, to be Permanent Secretary of the Ministry of Transport in Mr. Brooke's place.

Mr. Neil McLean, chief assistant engineer at the Harrogate Electricity Works, who is stated to have been in the service of the Corporation nearly 30 years, has been appointed borough electrical engineer, in succession to Mr. G. Wilkinson.

Mr. H. T. Tizard, C.B., A.F.C., F.R.S., has been appointed to be Secretary to the Committee of the Privy Council for Scientific and Industrial Research on the retirement of Sir H. Frank Heath, K.C.B., from that office on June 1st next.

The directors and staff of the United Alkali Co., Ltd., entertained their chairman, Sir Max Muspratt, to dinner at Liverpool last week, and presented him with his portrait in oils.

At a recent smoking concert Mr. W. Higgins was presented by his colleagues in the Superintending Electrical Engineers' Department with a gold watch upon his retirement after 46 years' service in Devonport Dockyard.

Increased sales of electric cooking and heating, &c., appliances have led the Birkenhead Town Council to appoint Mrs. McCullough, formerly a demonstrator with the General Electric Co., Ltd., Liverpool, as demonstrator at the showrooms.

Mr. George J. Hollyer, assistant electrical engineer to the Walthamstow Urban District Council, has been appointed borough electrical engineer and manager at Loughborough at £750 per annum, and will take up his new duties towards the end of April.

Mr. Emil Braathan, A.M.I.E.E., draughtsman and technical assistant at the Stepney electricity works, has been presented with an oak timepiece by his colleagues upon his leaving—after 13 years' service—to take up the position of switchgear engineer at the Hackney electricity works. The presentation was made by Mr. W. Young (resident engineer).

A Manchester paper states that Mr. S. J. Watson, chief engineer and manager of the Salford Electricity Department, has accepted the position of chief engineer to the London and Home Counties Joint Electricity Authority. "The resignation of Mr. Watson, who has been at Salford over four years, will probably be submitted to the Electricity Committee this week."

Mr. L. J. N. Kirkey, of Birmingham, has been appointed assistant mains superintendent to Chester Corporation Electricity Department.

The application of Mr. P. P. Wheelwright, borough electrical engineer at Blackburn for a reconsideration of his salary, has been withdrawn.

Mr. H. A. G. Howse, of the engineering department of Standard Telephones & Cables, Ltd., only son of Lady Howse, and the late Sir Henry Howse, was married at Sidcup on March 26th to Miss Elizabeth Helen Clark, only daughter of Dr. James and Mrs. Clark. Mr. Howse was presented with a collection of table silver by his colleagues in the engineering department.

We are informed that Mr. A. W. Empson, who relinquished the management of Empson Centrifugals, Ltd., in June last, has now resigned his directorship. His address is 46, Christchurch Avenue, N.W.6. ('Phone: "Willesden 4269.")

Obituary.—Mr. G. Clay.—The death occurred on March 14th of Mr. Gordon Clay, late secretary-general of the Egyptian State telegraphs and telephones.

Mr. W. R. Mickelwright.—We regret to learn of the death of Mr. W. R. Mickelwright, A.M.I.E.E., managing director of Mickelwright, Ltd., at the age of 42.

Wills.—The late Sir Frederick Green, one of the founders of the "Orient Line" and a director of the United River Plate Telephone Co., Ltd., left £338,066 gross and £321,875 net personalty.

The late Mr. T. W. Broadbent, of Huddersfield, left £5,591 gross and £2,248 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Young Accumulator Co., Ltd.—Private company. Registered March 23rd. Capital, £6,000 in 4,000 10 per cent. cumulative preference shares of £1 each and 40,000 ordinary shares of 1s. each. Objects: To carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical appliances, apparatus, novelties and specialities, &c. The subscribers (each with one preference share) are:—S. V. Spear, 3, The Close, Hatfield, Herts, insurance broker, A. H. Shaw, 47c, Lewisham Hill, Lewisham, S.E.13, company secretary. The first directors are Sir Frederick W. Young, K.B.E., Lt.-Col. Warwick Wright, D.S.O., T. E. Eachus, O.B.E., S. V. Spear, and S. A. Bayford, D.S.C. (addresses not stated). The said Sir Frederick W. Young shall be permanent chairman and managing director so long as he holds 1,000 ordinary shares. In the event of his resigning office, Sir Frederick W. Young & Co., Ltd., may appoint his successor in office. Qualification of ordinary directors, £10 shares. Managers: Sir Frederick W. Young & Co., Ltd. Secretary: A. H. Shaw. Solicitors: Constant & Constant, Exchange Chambers, 24, St. Mary Axe, E.C.3. Registered office: 101, Leadenhall Street, E.C.3.

Power Holdings, Ltd.—Public company. Registered March 24th. Capital, £100 in 60 7 per cent. cumulative participating preference shares of £1 and 80 ordinary shares of 10s. each. The objects are to form, promote, subsidise and assist companies, syndicates, and partnerships of all kinds, and particularly companies, syndicates and partnerships, to carry on or carrying on all or any of the businesses of electrical and general engineers, and manufacturers and maintainers of plant for the generation, accumulation, transmission and supply of electrical energy for light, heat, power or otherwise; to carry on business as bankers, capitalists, financiers, concessionaires, &c. The minimum cash subscription is seven shares. The subscribers (each with one ordinary share) are:—W. J. Yeoman, 244, Lordship Lane, East Dulwich, S.E.22, clerk; A. J. Clark, 114, Barrington Road, Crouch End, N.8, clerk; and five other clerks. Directors' qualification, £500. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.

Griffin, Harding & Bryant, Ltd.—Private company. Registered March 22nd. Capital, £3,500 in £1 shares (2,000 preference, 1,400 ordinary and 100 founders'). The objects are to adopt an agreement with T. C. Harding, H. F. Griffin, W. Griffin, and W. C. Bryant, and to carry on the business of electrical and radio-telegraphy engineers formerly carried on by them at 1, Park Lane, Swindon. The permanent directors are:—T. C. Harding, 12, Park Lane, Swindon (chairman); H. F. Griffin, 126, Dean Street, Swindon; W. Griffin, 49, York Road, Swindon; W. C. Bryant, 32, Westcott Place, Swindon. All are described as electrical and radio-telephony engineers. Qualification of permanent directors, 100 ordinary shares; of other directors, £1. Secretary: W. Griffin. Solicitors: Morrison and Masters, Swindon. Registered office: 1, Park Lane, Swindon.

Signs of the Times, Ltd.—Private company. Registered March 16th. Capital, £1,000 in £1 shares. Objects: To acquire the business of an electrical advertising expert and installation contractor carried on by A. Longfield, at 150, Moor Street, Birmingham, as "The Signs of the Times Company." The first directors are:—A Longfield, The Hollies, Walmley Road, Penns, Warwickshire, manufacturer; J. H. Dwyer, The Mount, Lapworth, Warwickshire, electrical engineer. Qualification, 50 shares. Registered office: 150, Moor Street, Birmingham.

London and Midland Manufacturing Co., Ltd.—Private company. Registered March 21st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus and component parts thereof, electrical engineers, &c. The first directors are:—C. S. Simpson, 86, Woodlands Avenue, Church End, Finchley, N.3, export manager; and G. B. Harold, The Very House, Worplesdon, Surrey, clerk. Qualification, one share. Solicitors: John Hands & Son, 99, Gresham Street, E.C.2.

Warner (Control), Ltd.—Private company. Registered March 18th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical and general engineers and contractors, manufacturers and sellers of transformers, radiators, dynamos, motors, and radio instruments, &c. The life directors are:—G. W. Parr, Loampit Hill House, Lewisham, S.E.13, engineer (chairman); E. J. Walker, 3, Chudleigh Road, Brockley, S.E.4, engineer. Solicitors: Rundle and Hobrow, 9, Ironmonger Lane, E.C. Registered office: 10, Bush Lane, Cannon Street, E.C.4.

Warner Trust, Ltd.—Private company. Registered March 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of mechanical, electrical, chemical, radio, hydraulic, automobile, and general engineers and contractors, &c. The life directors, solicitors, and registered office are the same as given for Warner (Control), Ltd., above.

Gordon Baynton, Ltd.—Private company. Registered March 21st. Capital, £2,000 in £1 shares (700 7½ per cent. cumulative preference and 1,300 ordinary). To acquire the business formerly carried on by the late C. S. Baynton, at 133, New Street, Birmingham, to adopt an agreement with G. Baynton, and to carry on the business of manufacturers of and dealers in instruments for the receiving or transmitting of sounds and signals by telephony or telegraphy by wireless methods or otherwise, electricians, engineers, &c. The subscribers (each with one share) are:—C. W. G. Baynton, 197, Russell Road, Mosley, Birmingham, wireless dealer; H. J. Gittoes, 14, Temple Street, Birmingham, C.A. C. W. G. Baynton is the first and managing director. Solicitors: Wallace Robinson & Morgan, 63, Temple Row, Birmingham. Registered office: 133, New Street, Birmingham.

Martin's, Electricians, Ltd.—Private company. Registered in Edinburgh March 23rd. Capital, £4,000 in 3,700 preferred ordinary shares of £1 and 6,000 deferred ordinary shares of 1s. each. Objects:—To carry on the business of electricians, mechanical and general engineers, dealers in wireless apparatus, &c. The first directors are:—J. Bogie, 15, Swan Road, Kirkcaldy, outfitter; H. W. Mickel, 4, Balwearie Road, Kirkcaldy, stockbroker; W. Gibson, 66, Ava Street, Kirkcaldy, electrical engineer; R. M. McPherson, 23, David Street, Kirkcaldy, stockbroker. Qualification, 100 shares. Secretary: H. W. Mickel. Registered office: 302, High Street, Kirkcaldy.

Official Returns of Electrical Companies.

Hammersley Bros., Ltd.—Issue on March 2nd, 1927, of £100 debentures, part of a series already registered.

Century Cables, Ltd.—Deposit on March 11th, 1927, of deeds of land and factory, buildings in Station Road, Addlestone, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £10,000.

Nox Electric Lamp Co., Ltd.—Satisfaction in full on March 1st, 1927, of debenture dated May 11th, 1923, securing £662 13s. 4d.

Particulars filed of £15,000 debentures authorised February 24th, 1927, charged on the company's undertaking and property, present and future, the amount of the present issue being £6,000.

J. & W. B. Smith, Ltd.—Satisfaction in full on March 10th, 1927, of debenture dated August 14th, 1924, securing £15,000.

Yale Electric Power Co., Ltd.—Capital, £20,000 in 3,300 preference shares of £1 each and 668 ordinary shares of £25 each. Return dated December 8th, 1926. 300 preference and 668 ordinary shares taken up. £15,300 paid. £1,700 considered as paid. Mortgages and charges, £6,000 debentures to cover day to day bank overdraft at December 8th, 1926, £5,950.

H. Kaplan, Ltd.—Capital, £5,000 in £1 shares. Return dated October 29th, 1926 (filed February 18th, 1927). 4,000 shares taken up. £3 paid. £3,997 considered as paid. Mortgages and charges, nil.

Radio Experts, Ltd.—Capital, £500 in £1 shares. Return dated December 18th, 1926. 200 shares taken up. £200 paid. Mortgages and charges, nil.

Roddis Electric, Ltd.—Capital, £2,200 in 2,000 preference shares of £1 each and 4,000 ordinary shares of 1s. each. Return dated December 31st, 1926 (filed January 22nd, 1927). 1,079 preference and 4,000 ordinary shares taken up. £904 paid on 904 preference shares. £375 considered as paid on 175 preference and 4,000 ordinary shares. Mortgages and charges, nil.

Electracts, Ltd.—W. B. Pearson, of 5, John Street, Bedford Row, W.C.1, was appointed receiver and manager on March 5th, 1927, under powers contained in debenture dated November 25th, 1926.

Midget Lamp Co. (1924), Ltd.—Capital, £2,000 in £1 shares. Return dated November 22nd, 1926. All shares taken up. £2,000 paid. Mortgages and charges, £500.

A. C. Hodson, Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1926 (filed February 19th, 1927). 1,250 shares taken up. £1,250 paid. Mortgages and charges, nil.

Westminster Engineering Co., Ltd.—Capital, £25,500 in 13,000 ordinary and 12,500 preference shares of £1 each. Return dated November 15th (filed December 28th), 1926. 8,560 ordinary and 9,279 preference shares taken up. £14 039 paid on 6,560 ordinary and 7,479 preference shares. £3,800 considered as paid on 2,000 ordinary and 1,800 preference shares. Mortgages and charges, £3,000.

Bury Lighting and Heating Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1926 (filed February 19th, 1927). All shares taken up. 18s. per share called up. £832 10s. paid, leaving £67 10s. in arrears. Mortgages and charges, nil.

Secar, Scott & Co., Ltd.—A. J. Kirby, of 7, Drapers' Gardens, E.C., ceased to act as receiver or manager on February 26th, 1927.

City Notes.

Midland Electric Corporation for Power Distribution, Ltd.

In the absence through ill-health of Mr. J. Taylor, chairman, Mr. D. Sinclair presided at the annual meeting last week, and in moving the adoption of the report (*vide* ELECTRICAL REVIEW, March 18th, p. 444) expressed the company's regret at the death of the vice-chairman, Sir J. S. Harmood-Banner. After reviewing the accounts, he said that the profit for the year had been reduced by nearly £10,000 by the coal dispute; that was the second time such a disturbance had occurred within six years. It was not until February this year that the sales of energy reached the level of the corresponding month of last year. The company had maintained a supply throughout the whole period. It had been handicapped by the high price and low quality of the coal which it was obliged to use, and only a part of the additional cost had been recovered from consumers. The number of consumers connected continued to increase, and a considerable increase in output was anticipated when trade recovered. It was hoped that the company's generating station would be handed over to the West Midlands Joint Authority during the current year; the company would then purchase its energy in bulk from the Authority (on which it had five representatives). The Authority was proceeding at once with the interconnection of the stations in its area, and plans had been laid for the erection of a large new station near Ironbridge. The latter, however, would not be available for at least three years. To meet the rapidly growing demand, the Authority had ordered 10,000 kW of plant for Walsall and proposed to install a further 10,000 kW at the company's Ocker Hill station. The report and accounts were adopted.

Mersey Power Co., Ltd.

In the course of his speech at the recent annual meeting of the Salt Union, Ltd., the chairman (Mr. G. H. Cox) dealt at some length with the company's chief subsidiary, the Mersey Power Co., Ltd. He said that after six years the company had paid a dividend of 5 per cent. When the company first started it utilised waste heat from a vacuum salt plant and paid handsome dividends. During the war the Government persuaded them to extend their facilities by the employment of steam plant. Since then growth had been rapid and the power station now had a plant capable of providing a continuous load of 24,000 kW, with necessary spare plant. The output had increased from 45,725,000 kWh in 1925 to 50,760,000 kWh last year. During the period of rapid expansion the payment of dividends was impossible, but the undertaking was now in the front rank and the sales and revenue were increasing. Referring to the Electricity (Supply) Act, 1926 Mr. Cox said that it placed very wide powers in the hands of those appointed to carry out its provisions, and unless those powers were wisely used the industry would be hampered rather than helped.

City of London Electric Lighting Co., Ltd.

In their report for 1926 the directors state that they regret that they are still unable to present a balance sheet definitely showing the financial position of the company under the London Electricity (No. 1) Act, 1925, as the L.C.C. has not yet approved the standard price submitted by the company. The directors are only able to show the result of the past year's working so far as it is known, and after paying the standard dividend the balance of the net revenue is held in suspense. After adjustment the capital expenditure at June 30th, 1925, is put at £2,634,514; the amount of free reserves available for capitalisation at December 31st, 1925, was £498,444. Of the latter sum £400,000 has been capitalised and issued as ordinary shares. The standard rate of dividend is now 10 per cent., and this will be paid in two equal half-yearly instalments. During the year considerable price modifications in favour of the consumers were made by the company. Meeting: April 6th.

Metropolitan-Vickers Electrical Co., Ltd.

The report for the past year records a profit of £273,646, and after meeting debenture charges and depreciation (£52,517) and transferring £25,000 to general reserve, there remains £154,674, to which is added £95,058 brought forward, making £249,732. A dividend of 8 per cent. is being paid on the ordinary shares, and £98,052 is carried forward. In spite of the industrial situation, the output last year was only slightly less than that of 1925; this is considered satisfactory. The company secured important contracts, both at home and abroad, and the volume of orders in hand at the beginning of

the year was sufficient, with new orders which will be obtained, to guarantee employment for the factories during the year. The reports mentions the resignations of Sir Vincent Caillard, Mr. L. Chandler, and Mr. Douglas Vickers from the board and the appointment of Sir David Yule, Sir Mark Jenkinson, and Messrs. A. McKinstry and G. E. Bailey as directors. The meeting is to be held on April 5th.

Metropolitan Electric Supply Co., Ltd.

The report for the past year states that since January 1st, 1926, the company has taken its supply in bulk from the London Power Co., which has taken over the Willesden station. The year's accounts are therefore not comparable with those of previous years. The gross revenue was £789,830, and the amount at the credit of net revenue account £253,055. To this is added interest and dividends from investments and allied undertakings making £328,713. After meeting the preference and standard ordinary dividends £13,377 is carried forward. The report recalls that £500,000 of the reserves was capitalised in December last and distributed to the ordinary shareholders in the ratio of one to each two shares held. The meeting was to be held on Wednesday last.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159.

Bell Brothers (Manchester, 1927), Ltd.—100,000 7½ per cent. cumulative participating preference shares of £1 each, 10s. paid, Nos. 1 to 100,000. 500,000 ordinary shares of 1s. each fully paid, Nos. 1 to 500,000.

Brush Electrical Engineering Co., Ltd.—6,558 ordinary shares of £1 each fully paid, Nos. 458,564 to 465,121.

Aluminium Corporation, Ltd.—10,007 new preference shares of £1 each fully paid, Nos. 130,861 to 140,867 (ranking for dividend from various dates).

Bath Electric Tramways, Ltd.

At the annual meeting on March 24th, the chairman (Mr. E. H. R. Trenow) said that at the beginning of the past year substantial progress was shown, but then the general strike and the mining dispute came and affected the company's business, and the net revenue was reduced by £1,981. On account of that the directors considered it prudent to limit the preferred ordinary dividend to 2½ per cent. They thought that when next the company applied for permission to increase fares it would have a good case to present to the Ministry of Transport. The receipts for the current year were, so far, below those for 1926, but that was due to factors which were being removed and was not regarded as of serious moment.

Richmond (Surrey) Electric Light and Power Co., Ltd.

The report for the past year shows that the capital expenditure was increased by £19,572 to £268,115. The amount available (including £2,630 brought forward) is £39,752. Out of this £1,351 is put to sinking fund, £10,000 to depreciation and renewals reserve, £750 to taxation reserve, and £7,000 to general reserve. The directors propose a final dividend of 5 per cent. on the ordinary shares, making 9 per cent. for the year, leaving £2,652 to be carried forward. The amount of energy sold rose from 2,522,274 to 2,713,533 kWh. The report records the death of Sir James W. Szlumper, a director. Meeting: April 7th.

South London Electric Supply Corporation, Ltd.

The amount carried forward from the last accounts was transferred to reserves for capitalisation. The net revenue for the year was £115,291, and from it the following payments are made:—Loan and debenture interest, £6,573; contingency fund, £2,620; taxation reserve, £11,500; sinking funds, £16,901. An interim dividend of 5 per cent. was paid on 260,000 ordinary shares; the number has since been increased to 494,000, by a bonus issue, and a dividend of £5 17s. 6d. per cent. is recommended on these. A balance of £33,874 is carried forward. The amount of energy sold rose from 14,515,019 to 15,202,623 kWh. Meeting: April 5th.

South Metropolitan Electric Light and Power Co., Ltd.

The 1926 revenue account shows a credit balance of £179,884; to this is added £4,011 brought forward, making £183,895. From this debenture interest is paid, £3,807 is carried to depreciation fund, £16,000 to taxation reserve, and £32,085 to depreciation reserve. An interim dividend of 5 per cent. was paid on 250,000 ordinary shares. Since then the number of ordinary shares has been increased to 600,000 by a bonus issue and the dividend on these is 6 per cent. A balance of £52,419 is carried forward. The energy sold increased from 29,653,143 to 30,599,681 kWh. Meeting: April 5th.

Windermere and District Electricity Supply Co., Ltd.

The balance available for the past year (including £1,693 brought forward, and interest and dividends received) is £10,003. Out of this debenture interest is paid, £250 is written off the free-wiring account, £2,000 transferred to depreciation reserve, and £2,000 to reserve fund. The total dividend on the 6 per cent. cumulative preference shares is 8¼ per cent., clearing arrears to April 30th, 1915. The 7½ per cent. preference dividend is paid and £2,240 is carried forward.

Keswick Electric Light Co., Ltd.

Out of an available balance of £2,133, £1,500 is devoted to writing off certain sums and reserves, and a dividend of 5 per cent. is paid on the ordinary shares, leaving £222 to be carried forward.

Yorkshire (West Riding) Electric Tramways Co., Ltd.

Sir George E. Leon, Bt. (chairman) presided at the annual meeting on March 23rd, and in presenting the report and accounts (*vide* our last issue, p. 487) referred to the death of his father, the late chairman (Sir Herbert S. Leon). The coal dispute had substantially reduced the company's revenue, and a further adverse factor had been motor-'bus competition. Until the licensing authorities took steps with regard to the latter they could not look forward to the future with any confidence. Nevertheless, the company would be able to weather the storm; already there were signs of a dawning reasonableness among their competitors. They realised that eventually tramways might be superseded by omnibuses, and they were accordingly increasing their motor-'bus business in preparation for that day. The report and accounts were adopted.

London Electric Supply Corporation, Ltd.

In common with the other London companies, this company prefaces its report with the announcement that the accounts have been prepared in accordance with the London Electricity (No. 2) Act, 1925. The profit for the past year was £200,079 (against £202,426). After meeting debenture interest and sinking fund contributions the available balance is £102,677. The preference and standard ordinary dividends are paid and a balance of £1,784 is carried forward. The amount of energy sold rose from 90,905,284 kWh to 131,873,891 kWh. The average receipts per kWh fell from 1.22d. to 1.11d. The meeting was to be held yesterday (Thursday).

Bournemouth and Poole Electricity Supply Co., Ltd.

The balance on the revenue account for 1926 was £141,418, and to this is added £10,076 brought forward, making £151,494. After meeting the debenture interest and special redemption fund payment the reserves receive the following sums:—Depreciation, renewals, &c., £25,000; taxation, £5,000; general, £50,000. A final ordinary dividend of 5½ per cent. is recommended, making 10 per cent. for the year, less tax, together with a bonus of 4 per cent., free of tax. This leaves £9,376 to be carried forward. The sales of energy rose from 9,715,129 to 10,656,342 kWh. Meeting: April 7th.

Para Electric Railways and Lighting Co., Ltd.

The gross receipts for 1926 were £203,902, as compared with £144,015 in 1925, and the net revenue rose from £60,030 to £71,436. After meeting debenture charges and other expenses, there was a credit balance of £27,600. The accrued debit balance is cleared off, £10,000 is transferred to reserve, and £7,785 is carried forward. The improved position is said to be due to the rise in the value of the milreis and the revision of fares which was put into force. Meeting: April 5th.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The report for the year ended December 31st last states that the accounts have been prepared in accordance with the London Electricity (No. 2) Act, 1925. The connections increased from 25,353 to 27,499 kW, and the energy sold amounted to 12,315,290 kWh. The net profit for the year was £31,259, and after paying the preference and standard ordinary dividends, a balance of £2,134 is carried forward. The meeting was to be held yesterday (Thursday).

Costa Rica Electric Light and Traction Co., Ltd.

The report for 1926 records net earnings in Costa Rica of £27,611 (against £27,808), and the net profit is £9,500 (against £8,906). The balance of net profit has again been placed to the depreciation and renewals account. During the year extensions costing about £30,000 were carried out, and it is anticipated that increased business will result. The meeting was to be held yesterday (Thursday).

Egham and Staines Electricity Co., Ltd.

The net profit for 1926 was £20,247, and after meeting debenture interest, preference dividend, &c., it is proposed to pay a dividend of 5 per cent. on the ordinary shares. During the year over £42,000 was spent on distributors and services; the sale of energy is growing and the extensions made are being rapidly developed. Meeting: April 4th.

Anglo-Portuguese Telephone Co., Ltd.

The report for the past year records a gross income of £166,567, a gross profit of £52,055, and a balance available of £60,364 (including £27,591 brought forward). A final dividend of 4 per cent. is to be paid, making 7 per cent. for the year (against *nil* for 1925) and £20,319 is carried forward. The annual meeting was held on Monday.

Durelco, Ltd.

The report for the year ended September 30th last shows a profit of £155, after writing off a part of the debenture expenses. The combined profits of the company's subsidiaries, before providing for debenture interest, &c., was over £19,000. The total standing to the credit of profit and loss accounts of subsidiaries is £41,740.

North British Aluminium Co., Ltd.

The directors state that the construction of the Lochaber hydro-electric works was retarded last year by the mining dispute, but satisfactory progress is now being made. The annual meeting was to be held yesterday (Thursday).

German Companies.

The *German Telephone Works and Cable Industry Co.*, Berlin, states that larger orders were received in 1926 from the Reich postal authorities for the telephone factory, particularly for automatic installations, while business in individual apparatus and private telephone installations again showed an increase. The greatest high-frequency network in the world is in hand for Finland. The cable factory was satisfactorily occupied. The dividend is 6 per cent. out of net profits of 509,000 marks, as in 1925.

The *Wolfram Lamp Company*, Augsburg, which is closely associated with the Osram Company, reports net profits of 68,000 marks for 1926, as against 62,000 marks in the previous year, the rate of dividend being 10 per cent., as in 1925. At the recent meeting it was mentioned that in the second half of last year the company changed over exclusively to the manufacture of the "N" lamps (new "Osram" lamps), and that the present course of business is satisfactory.

Brown, Boveri & Co., Baden, report a net profit for last year of £51,417, as compared with £43,025 in 1925. Although in the meantime the capital of the concern has been increased from £250,000 to £750,000, the dividend is being raised from 7 per cent. to 8 per cent.

The *Electricity Supply Company*, Berlin, reports net profits of 2,300,000 marks, as compared with 2,080,000 marks in 1925. The dividend is to be raised from 9 to 10 per cent.

The *German Cable Works Company*, Berlin, states that the works were well employed during 1926, and although sale prices reached a very low level, the value of the turnover increased by nearly 50 per cent. over the previous year. Large orders were received from Government departments, and the export trade was also materially greater than in 1925. The accounts show net profits 350,000 marks as against 376,000 marks in 1925, and the dividend remains at 6 per cent.

The *Electro-Works Company*, Berlin, which is now in the possession of the Reich, reports net profits of 5,060,000 marks, as against 5,010,000 marks in 1925, the dividend being maintained at 8 per cent.

French Companies.

A number of French electricity supply undertakings are increasing their capital for plant extension purposes. Thus the capital of the *Société Electrique du Nord-Ouest* is being raised from 56 to 65 million francs; that of the *Société Pyrenéenne d'Energie Electrique* from 30 to 35 million francs; and that of the *Société Union Hydro-Electrique Amoricaine* from 12 to 27 million francs.

Swiss Companies.

The *Schweizerische Gesellschaft für Elektrische Industrie*, of Basle, is declaring a dividend of 8 per cent. on all three classes of shares for the past financial year, as in 1925. A sum of £20,000 is also being placed to special reserve.

The *Oerlikon Accumulator Company* proposes to pay a dividend of 20 per cent. for 1926, as in the previous year. The share capital is to be increased from 2,200,000 to 2,500,000 fr.

Swedish Company.

The *A.B. Elektrolux* reports gross profits of 2,450,000 kr. for 1926, and net profits of 1,018,000, as against 705,000 kr. in 1925. It is proposed to pay a dividend of 10 per cent., as against 8 per cent. in 1925.

British Engine, Boiler and Electrical Insurance Co., Ltd.

An interim dividend of 13s. per share was paid in June last, and after transferring £20,000 to the pension fund, and £10,000 to the contingency fund, there remains a balance of £24,567. The directors recommend a final dividend of 14s. per share.

Parker, Winder & Achurch, Ltd.

The profit for 1926 was £10,407, and to it is added £7,958 brought forward, making £18,365. A final dividend at the rate of 15 per cent. is declared, making 10 per cent. for the year, as for 1925; £5,000 is transferred to reserve, and £9,264 carried forward.

Canadian Light and Power Co.

The report just issued is the first since the company's acquisition by the Shawinigan interests. The revenue was $313,404 gross and $51,716 net. Of the latter sum $32,997 was transferred to sinking fund reserves, and the balance to depletion reserve. The total assets are given as $6,810,987.

Robey & Co., Ltd.

There was a loss of £29,385 during the past year, as compared with a profit of £5,997 in 1925 before meeting debenture interest.

Montreal Light, Heat and Power Co.

A dividend of $0.5 per share has been declared on the common shares for the quarter ended March 31st.

P. & W. Maclellan, Ltd.

The balance to the credit of the profit and loss account for 1926 is £13,608 (against £30,239). The directors state that they cannot recommend the payment of the preference dividend.

Stewarts & Lloyds, Ltd.

The profit for 1926 was £186,911, as compared with £291,119 in 1925. The dividend on the deferred shares is reduced from 7½ to 2½ per cent.

Victoria Falls and Transvaal Power Co., Ltd.

It is reported that the net earnings of the company for the quarter ended December 31st last were £266,311, before providing for taxation.

Direct Spanish Telegraph Co., Ltd.

The board recommends a dividend of 10 per cent. on the ordinary shares, free of tax, for the past year. An interim dividend of 4 per cent. has already been paid.

G. D. Peters & Co., Ltd.

The net profit for the past year was £9,530 (against £7,203). The preference dividend is passed, £12,830 being carried forward.

Tilling-Stevens Motors, Ltd.

The profit for 1926 was reduced from £36,888 to £3,512 and the preference dividend is passed.

Associated Telephone and Telegraph Co.

The usual quarterly dividend of $1.75 per share on the 7 per cent. preferred stock has been declared.

Stocks and Shares.

MONDAY EVENING.

ALTHOUGH business has fallen away to a great extent in the Stock Exchange markets as compared with what it was a month ago, a state of affairs which is deemed to be due to the news from China and the near advent of the Budget, prices are well maintained, and there is a steady flow of investment capital into industrial shares as well as into more gilt-edged securities. In regard to the Budget, there is little doubt but that the uncertainties surrounding its provisions are having the effect of laying a check upon enterprise, or willingness, on the part of those with capital. People want to see how the cat is going to jump before they invest money, or speculate in stocks and shares. It is not anticipated that the electrical industry will be affected in any direct manner. Prices in the manufacturing group are inclined to be heavy, owing to the less optimistic view that is now taken of the next batch of dividends.

The Home Railway market appears to be regaining a little of its past popularity. The public are not anxious to invest money in Home Railway stocks, but prices have reached levels at which they make an appeal to the speculative spirit, and the Undergrounds are doing sufficiently well to warrant the speculative investor taking up Districts and Metropolitans, with Underground £1 shares as a makeweight, so to speak, in the expectation of materially higher prices in two or three years' time. It is generally admitted that some kind of regulation must be imposed for the sake of the travelling public upon transport in London, and this, when it comes, will put a stop to the indiscriminate competition that has barred the way to a proper settlement of the problem. Logically, it is absurd that so much money should be employed in the industry without any return being obtainable from it. Admitting that grave mistakes were made years ago, when the companies were started, the fact remains that the latter have provided, and are still providing, indispensable services, in return for which those people who put up the money to finance them are entitled to some modest income in the shape of dividends. Underground £1 shares are 1s. higher at 16s. 6d.

Most of the London electricity supply companies have now issued their reports, and amongst those which have made their appearance during the past week are Chelsea, Brompton, Charing Cross, London Electric, Metropolitan, and St. James'. The figures are very much what the market had expected them to be, though the Metropolitan has done better than anticipation looked for. The Bournemouth & Poole is repeating its 14 per cent. dividend of last year, though the profit is less than that of a year ago. Richmond (Surrey) Electric Light and Power Company shows an improvement of about £900 at £37,100 in its revenue balance. It will be remembered that the latter company issued, not long ago, a fresh amount of ordinary capital which now ranks for dividend. On the increased capital the dividend is 9 per cent. against 10 per cent. previously. The price of Richmond shares is about 29s. 6d., while Bournemouth & Poole stand at 3 1/32.

It now becomes possible to re-arrange the dividend tables in such manner as will permit the inclusion of the 1926 figures in the majority of cases. There are still some companies that have not announced their figures, but the blanks will be supplied as soon as the companies' declarations are made. As regards the London electricity supply shares, the only com-

pany whose figures cannot yet be included is the Notting Hill. The rest can be set out as follows:—

Company.	Dividend 1926. Per cent.
Brompton & Kensington	8.6275
Charing Cross	8.15
Chelsea	8.875
City of London	10
County of London	7 1/7th
Kensington & Knightsbridge	8
London	8.4285
Metropolitan	8
St. James' & Pall Mall	7.9375
South London	8¼
South Metropolitan	8 1/12th
Westminster	8.8

The standard dividend up to and including 1931 on the present increased ordinary share capital is paid by the Brompton, Chelsea, City of London, London, St. James's and Westminster Companies. The Metropolitan's is better than the standard rate, and the South London's 8¼ is a shade below the precise 8.5789 per cent., which is the exact standard. To include four places of decimals in the dividend columns of our tables would be as awkward as it would be valueless. Therefore we have given the nearest vulgar fraction to the decimal, without going into minute differences. The yields are calculated, as before, on the basis of the 7 per cent. dividends that will probably rule after 1931. At the risk of being tedious, we would add that in all the London electric supply shares, the actual yields at the present time are higher than those set out in our column, and will continue to be so for the next five years.

South Londons are 1s. higher at 25s. 6d. Midland Electric Corporation Power shares rose ½ to 55s. In the foreign list, Shanghai Electrics receded 1/10 to 37s. 6d. The Shanghai Stock Exchange has taken the unusual course of asking the London Stock Exchange to express its thanks to the British Government for sending troops to protect life and property in that city.

The English Electric report shows that the company made a small profit on trading, but that this was changed into a very unpleasant loss by the various charges. The net profit came to the bagatelle of £10,000, comparing with £195,000 last year and £263,000 in the year before, but interest charges absorb £124,400, and £9,000 was written off expenses of the debenture issue, in addition to which a further £29,500 has to come in as the half-year's preference dividend paid to June, 1926. The deficit carried forward is £78,600. The directors attribute the disappointment to the coal strike and the dislocation of works thereby occasioned. They refer to fierce competition in foreign and colonial markets for heavy electrical and mechanical machinery, but once more the report sounds a note of hopefulness in regard to the future. The price of the preference shares has fallen a shilling to 12s. 6d., and manufacturing shares are dull as a whole. Electric Constructions are lower, and so are Metropolitan-Vickers and India Rubber, though Henleys at 90s. are a little better. British Electric Transformer are a good market, on the resumption of dividends on the ordinary shares with 5 per cent., the first time a dividend has been paid on these for six years. The shares strengthened to 16s. 6d., the preference remaining at about 18s. 9d. The latter receive 10½ per cent. dividend, which includes the six months' arrears due to them. All the arrears have thus been wiped off.

Automatic Telephones are flat at 50s., the 10 per cent. dividend being regarded as anything but encouraging. The yield on the money for some time past has been so trifling as to imply the anticipation of a bonus or share distribution of some kind that would justify the comparatively high figure at which the price ruled. Nothing has happened, however, and this week's drop of 3s. 3d. is the result of selling on the part of the people who are tired of waiting for something better. The current price includes the dividend recently declared. Telephone Manufacturing shares went down to 6s. 6d., but rallied to 7s. International Telephones are two guineas, and the deferred stand at £2.

The Eastern cable quartette is somewhat irregular, Easterns being a point up and Eastern Extensions ½ down. Marconis are holding their rise at 17s. 6d., and Marconi Marines scored a further improvement at 23s. 9d., Canadians being a firm market at 4s. Interest has been revived in Marconi shares, and a feeling of subdued hopefulness is the principal feature in the situation. The Marine Company paid 7½ per cent. for the last completed year, and an interim dividend of 3¾ per cent. in October, 1926. It is hoped that the final may be 6¼ per cent., to make 10 per cent. for the whole of last year.

British Electric Traction ordinary has receded a point. British Columbia stocks are inclined to be lower. Anglo-Argentines made further improved progress, and Brazilian Tractions have shot up 3 points. The Mexican group is quietly firm. Barcelona Tractions have been moving in consonance with Brazilians, being better at 47. Depression continues to characterise the iron and steel list. Company reports and accounts for 1926 are mostly couched in melancholy vein, as the coal stoppage rendered it inevitable that they would be, and confidence has yet to revive in the outlook for a return to prosperous conditions this year. Rubber shares show hesitation in view of the new electrical treatment said to have been discovered for the lengthening of the life of rubber by giving it a greater resiliency and wearing capacity.

Share List of Electrical Companies.

	Nom.	Dividend. 1925.	1926.	Price Mar. 28 1927.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.	£					
Bournemouth and Poole	1	14	14	60/9	—	4 12 0
Brompton Ordinary	1	10	8¾	25/-	—	5 12 0
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. ½ Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	8¾	25/-	—	5 12 0
City of London	1	15	10	2 [1]	—	... ...
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—	5 6 8
County of London	1	15	7⅞	28/-	—	5 0 0
do. do. 6% Pref. ...	1	6	6	22/6	—6d	5 6 8
Edmundson's Ordinary	1	7	8	26/3	—	6 2 0
do. 7% Pref.	1	6	7	23/-	—	6 1 9
Elec. Supply Corporation ...	1	10	10	30/6	—	6 11 2
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	8½	24/6	—	5 14 2
do. do. 6% Pref.	5	6	6	5½	+½	5 9 1
Metropolitan	1	11	8	27/6	+6d	5 1 10
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	22/6	—	5 6 8
Newcastle-on-Tyne Ordinary ...	1	7	7	23/-	—	4 10 9
do. 5% Pref. ...	1	5	5	17/6	—	5 14 3
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	—	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8¼	25/6	+1/-	5 9 10
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	4	7	25/6	—	5 9 10
do. 6 % Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	8¾	25/- xd—		5 12 0
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	20 3xd +3d		7 8 2
Yorkshire Elec.	1	8	8	29/6	—	5 8 4
HOME RAILS.						
Central London Ord. Assented ...	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	3	63	—	4 15 3
do. District	,,	3½	3½	59	—	5 18 8
Underground Electric	£1	Nil	1½	16/6	+1/-	1 16 4
do. do. Income ...	Bonds	6	6	101	—	*5 18 10
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	100	—	6 0 0
do. Def.	,,	1½	1½	23¾	—	6 6 0
Automatic Telephone	1	3	10	50/-	—3/3	4 0 0
Chili Telephone	5	5	6	7	+¼	4 5 9
Cuba Sub. Ord.	10	5	5	7	—	7 2 10
Eastern Extension	10	10	10	17½	—¼	*5 14 3
Eastern Tel. Ord.	Stock	10	10	173½	+1	*5 15 3
Globe Tel. and T. Ord.	10	10	10	18¼xd	—¼	*5 9 7
do. do. Pref.	10	6	6	10¾	—¼	5 10 4
Great Northern Tel.	10	22	20	27	+½	7 8 2
Indo-European	25	8½	10	46½	—	*5 7 6
Marconi	1	Nil	Nil	17 6	—	... ...
Marconi-Marine	1	10	7½	23/9	+£d	6 6 4
Oriental Telephone Ord.	1	12	12	53/3	—	*4 12 0
United R. Plate Tel.	5	8	8	8¼	—⅛	*4 12 1
Western Telegraph	10	10	10	16¾xd	—1	*5 19 5
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3 5/8	+1/16	8 6 0
do. do. 2nd Pref. ...	5	6	6	3 7/8	+1/16	9 1 2
do. do. 5% Deb. ...	Stock	5	5	71½	—	7 0 0
British Electric Traction Ord. ...	,,	8	—	143½	—1	5 11 6
do. do. 6% Pref. ...	,,	6	6	109	—	5 10 1
Brazil Traction	100	5	6	131½	+3	4 11 3
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	89½	—	5 11 9
do. do. Preferred ...	,,	6⅔	6⅔	117½	—	*5 6 5
do. do. Deferred ...	,,	8	—	158	—1	*5 1 3
do. do. Deb. ...	,,	4½	4½	79½	—	5 7 0
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	7/3	—	Nil
London United Tram. Deb. ...	Stock	4	4	51	—	7 16 10
Mexico Trams, 5% Bonds	—	5	5	21½	—	6 18 0
Mexican Light Common	100	Nil	Nil	46	—	Nil
do. Pref.	100	Nil	Nil	97½	—	Nil
do. 1st Bonds	—	5	5	71½	—	6 19 10
Yorkshire (West Riding)	1	5	—	8/9	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	—	52/6	—	4 19 1
British Aluminium Ord.	1	12½	10	45/-	—	4 9 5
British Elec. Transformer Pref. ...	1	Nil	7	18/9	—	7 9 0
British Insulated Ord.	1	15	—	68/9xd	—1/9	4 7 9
Brush Ord.	1	10	—	28/3	—	7 1 7
Callenders	1	15	—	3½	—	4 5 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	85	—	5 17 8
Electric Construction	1	10	—	30/-	- 1/3	6 13 4
Enfield Cable Pref.	1	7½	7½	1¾	—	6 6 4
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	3	—	12/6	—1/-	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	7½	—	3 4/6	—	4 18 4
Henley	1	20	—	90/-	+9d	4 8 11
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	18/9	—1/3	*5 6 8
Johnson & Phillips	1	17½	—	2⅝	—	6 13 4
Met.-Vickers Ord.	1	8	—	28/9	—	5 11 4
do. Pref.	2	8	8	2 7	+⅛	6 11 5
Siemens Ord.	1	7½	—	26/9	—9d	5 12 2
Telegraph Construction	12	10	10	29xd	—1½	*4 2 9

* Dividends paid free of Income Tax.

The Electrical Exports of Germany.

Statistics for 1925 and 1926 Compared.

WITH the publication of the monthly returns, for December, and the twelve months of 1926, of the foreign trade of Germany, some interesting information regarding the progress of the electrical trade of the country is available. As, however, a number of alterations in the classification were made on October 1st, 1925, when the new Customs tariff came into operation, an exact comparison of the results for 1925 and 1926 is not always possible. In the following table are shown the number of dynamos, motors, convertors and transformers of certain specified weights exported during 1926, together with the total weight in double centner (= 220 lb.) and the value in gold marks.

	Number.	Weight. Do. c'tner.	Value. Gold mk. (thousands)
Up to 10 kg.	261,308	4,691	4,974
10 kg. to 25 kg.	23,765	3,934	2,223
25 kg. to 150 kg.	46,194	31,437	8,447
150 kg. to 500 kg.	10,159	27,524	7,038
500 kg. to 3,000 kg. ...	5,072	55,504	11,774
Over 3,000 kg.	791	86,605	13,575

Argentina, Holland, Austria, and Czecho-Slovakia figure prominently amongst the destinations of machines up to 150 kg. in weight; Russia, Italy, Argentina and Brazil are good customers for those from 500 to 3,000 kg., whilst of those over 3,000 kg. 86 went to Argentina, 72 to Italy, 61 to Russia, and 48 to Spain during the period mentioned.

In regard to the following items a useful comparison can be made of the results for the two full years:—

	1925.	1926.	Inc. or dec.
Armatures and commutators—			
Value (Reichsmark) ...	5,554,000	5,106,000	– 448,000
(Double centner)	24,137	16,421	– 7,716
Accumulators, plates, &c.—			
Value (Reichsmark) ...	6,354,000	8,212,000	+ 1,858,000
(Double centner)	40,177	49,778	+ 9,601
To Denmark ,,	6,063	12,998	+ 6,935
,, Finland ,,	1,068	850	– 218
,, Gt. Britain ,,	1,149	1,125	– 24
,, Holland ,,	5,360	6,546	+ 1,186
,, Sweden ,,	14,887	16,386	+ 1,499
Electric cable—			
Value (Reichsmark) ...	35,971,000	54,893,000	+18,922,000
(Double centner)	344,163	471,273	+ 127,110
To Denmark ,,	15,123	3,177	– 11,946
,, Gt. Britain ,,	8,174	11,424	+ 3,250
,, Italy ,,	26,083	1,022	– 25,061
,, Holland ,,	109,686	127,960	+ 18,274
,, Norway ,,	28,864	12,633	– 16,231
,, Poland ,,	24,870	9,844	– 15,026
,, Argentina ,,	34,966	54,039	+ 19,073
,, Spain ,,	*	20,956	—
,, Japan ,,	*	17,497	—
Electric safety and signalling apparatus—			
Value (Reichsmark) ...	6,076,000	5,159,000	– 917,000
(Double centner)	8,967	9,299	+ 332
To Denmark ,,	568	452	– 116
,, Gt. Britain ,,	1,536	4,302	+ 2,766
,, Italy ,,	652	338	– 314
,, Holland ,,	904	705	– 199
,, Austria ,,	637	128	– 509
,, U't'd States ,,	650	*	—
Galvanic batteries and parts and heating elements—			
Value (Reichsmark) ...	10,452,000	10,714,000	+ 262,000
(Double centner)	53,928	53,404	– 524
To Gt. Britain ,,	25,355	27,159	+ 1,804
,, Holland ,,	6,625	6,531	– 94
,, Sweden ,,	6,894	6,074	– 820
Insulating material of asbestos, mica, and micanite—			
Value (Reichsmark) ...	850,000	571,000	– 279,000
(Double centner)	613	492	– 121
To Gt. Britain ,,	93	*	—
,, Austria ,,	*	64	—
Insulating tubes of paper or cardboard—			
Value (Reichsmark) ...	2,508,000	1,873,000	– 635,000
(Double centner)	24,840	17,935	– 6,905
To Russia ,,	3,477	2,155	– 1,322
,, Sweden ,,	4,644	2,810	– 1,834
Telephone material—			
Value (Reichsmark) ...	17,980,000	29,633,000	+11,653,000
(Double centner)	10,052	16,432	+ 6,380
To Holland ,,	725	1,490	+ 765
,, Switzerland ,,	789	749	– 40
,, Japan ,,	1,817	1,267	– 550
,, Italy ,,	*	4,446	—
Wireless material—			
Value (Reichsmark) ...	29,566,000	31,636,000	+ 2,070,000
(Double centner)	31,230	29,021	– 2,209
To Denmark ,,	915	2,811	+ 1,896
,, Gt. Britain ,,	17,640	11,353	– 6,287
,, Holland ,,	1,478	1,854	+ 376
,, Sweden ,,	1,781	2,440	+ 659
,, Japan ,,	1,902	482	– 1,420
Measuring and recording instruments—			
Value (Reichsmark) ...	31,564,000	30,619,000	– 945,000
(Double centner)	39,171	28,333	– 10,838
To Gt. Britain ,,	1,704	1,469	– 235
,, Italy ,,	5,284	5,281	– 3
,, Holland ,,	3,795	3,025	– 770
,, Russia ,,	2,468	1,418	– 1,050
,, Sweden ,,	1,998	1,325	– 673
,, Spain ,,	1,786	1,242	– 544
,, Czecho-Slovakia ,,	1,686	953	– 733
,, Japan ,,	5,371	913	– 4,458
,, Argentina ,,	2,271	2,748	+ 477
Metal filament lamps—			
Value (Reichsmark) ...	25,470,000	20,305,000	– 5,165,000
(Hundreds)	558,205	488,035	– 70,170
Weight (Double centner)	12,676	9,103	– 3,573
To Denmark ,,	30,002	24,396	– 5,606
,, Finland ,,	16,879	11,699	– 5,180
,, France ,,	12,438	7,328	– 5,110
,, Gt. Britain ,,	68,464	86,552	+ 18,088
,, Italy ,,	51,298	32,015	– 19,283
,, Norway ,,	15,950	9,301	– 6,649
,, Austria ,,	25,037	30,072	+ 5,035
,, Russia ,,	31,099	*	—
,, Sweden ,,	35,596	33,829	– 1,767
,, Switzerland ,,	15,157	12,736	– 2,421
,, Czecho-Slovakia ,,	33,933	30,437	– 3,496
,, China ,,	13,214	17,299	+ 4,085
,, Argentina ,,	11,878	20,134	+ 8,256
,, U't'd States ,,	25,536	11,039	– 14,497
,, Brazil ,,	23,362	6,086	– 17,276

* Figures not available.

German Manufacturers' Combine.

With the object of reducing competition, a joint sales office has lately been established in Berlin under the title of the Verkaufs Gesellschaft Elektrotechnischer Spezialfabriken by a number of German manufacturers of electrical machinery and apparatus. Among the firms embraced in the new scheme are the Maffei-Schwartzkopff Co., of Munich and Berlin, the Pöge Elektricitäts Gesellschaft, Chemnitz; Voigt & Haeffner Gesellschaft, Frankfort-am-Main; the Dr. Paul Meyer Gesellschaft, Berlin; the Sachsenwerk Licht-und-Kraft Gesellschaft, Dresden; Dr. M. Levy, Fabrik Elektrischer Maschinen und Apparate, Berlin; and the Lloyd Dynamowerke Gesellschaft, Bremen.

Large German Rectifier Order.

What is stated to be the largest order for rectifiers and rectifier transformers so far placed has lately been secured by Brown, Boveri & Co., Baden, Switzerland—*viz.*, 95 rectifiers with transformers, air pumps and accessories having a total output of 114,000 kW, in connection with the electrification of the Metropolitan Railways of Berlin to convert the 30,000-V, 80-period a.c. supplied by the Berlin municipality to 800 V d.c. The contract also includes the supply of 160 high-speed 3,000-A circuit breakers for the d.c. side of the sub-stations. The rectifiers are notable not only from their mean continuous output of 1,200 kW per unit (1,500 A), but by the required overload capacity. The starting current of a motor coach is 3,000 A during 40 seconds, followed by 300 A during 50 seconds, this process being repeated every 90 seconds. The rectifiers will be located in 40 small sub-stations; these will be built into the arches of the viaducts and feed directly on to the rails. The German State Railway Co. has also divided the contract for thirty rectifying installations for the less important suburban lines between the Allgemeine Electricitats Gesellschaft, the Siemens-Schuckertwerke, and the Bergmann Co., of Berlin.

London's Electricity Supply in 1924-1925.

The L.C.C. Annual Report.

THE last of its annual reports on electricity supply in London (covering the year 1924-25) has been received from the London County Council (P. S. King & Son, Ltd. Price, with map, 5s.). In future the collection of statistics, &c., will be in the hands of the London and Home Counties Joint Electricity Authority. The period covered is the year ended March 21st, 1925, in the case of local authorities, and the year ended December 31st, 1924, for the companies. The area dealt with is 1,797 sq. miles with a population of 8,178,766 (1921 census) and a rateable value of £75,926,030 (April, 1925). The total number of authorised distributors was 89, comprising 44 local authorities and 45 companies. These figures include three local authorities not actually supplying electricity and exclude two purely bulk-supply companies. The first part of the report gives the areas, populations, and rateable values of the districts supplied by undertakers, together with particulars of the Orders authorising supply, &c.

Section (*b*) deals with plant capacity and output. It is shown that generating capacity rose from 758,477 kW to 843,517 kW, an increase of about 11.2 per cent. The local authorities' plant increased from 357,182 kW to 391,037 kW (9.5 per cent.), and that of the companies from 401,295 kW to 452,480 kW (12.7 per cent.). There was a fairly large rise in the capacity of plant installed for transforming bulk supplies, from 131,000 kW to 166,546 kW (27 per cent.); this increase was mainly attributable to the company undertakings. The number of consumers (premises connected) at the end of the respective periods was:—Local authorities, 228,404; companies, 251,984*; total, 480,338. The last figure represented an increase of about 9 per cent. The increases in connections were as follows:—Local authorities to 660,970 kW (8.8 per cent.); companies to 810,224 kW (14.0 per cent.); total 1,471,194 kW (11.6 per cent.). The total maximum demand rose from 550,268 kW to 606,420 kW, and the load factor improved from 21.6 to 22.3 per cent. (local authorities from 23.1 to 23.3 per cent.; companies from 20.3 to 21.4 per cent.).

The next section deals with output and sales. The total amount of energy sold by the municipal undertakings, deducting intersales, was 479,620,308 kWh, as against 426,801,721 kWh, an increase of 12.4 per cent. The companies sales rose by 15 per cent. to 521,679,086 kWh, and the grand total by 13.3 per cent. to 964,924,072 kWh. Of this total traction supply accounted for 50,671,801 kWh, as compared with 46,480,498 kWh in 1923-24.

Financial results are next dealt with. The total capital investment of the municipal undertakings at March 31st, 1925, was £19,232,872, indicating an expenditure of £1,296,146 during the year. (These figure exclude expenditure out of revenue.) The total loans raised amounted to £18,988,370, and 40.31 per cent. of this amount had been repaid or was provided for by sinking fund. The average rate of interest was 4.60 per cent. The revenue from all sources for the year under review was £4,438,174 (as against £4,202,706), while the working expenses were £2,352,188 (£2,221,441), and after meeting rates, taxes, &c., the balance available to meet capital charges was £1,887,915 (£1,782,209). Out of this were paid:—Interest, £526,342; loan repayment, £737,348; reserve funds or capital expenditure, £471,782; making a total of £1,735,469 (against £1,573,620). The net profit was thus £152,446, as compared with £208,589. Nothing was taken from the rates, but 17 undertakings contributed a total of £145,960 to rate relief.

The tables relating to the company undertakings show a total capital expenditure of £28,968,474 at December 31st, 1924, as against £26,253,452 at the end of 1923, an increase of £2,715,022. The total capital called up rose by £1,014,466 to £23,781,563.* Ordinary capital represented 34.5 per cent.† of this; preference capital 27.0 per cent.†; and debenture capital 38.5 per cent.† The average rates of dividend on the ordinary and preference shares were 13.42† and 5.87 per cent.† respectively. The over-all average rate of dividend and interest was 8.11 per cent†, as compared with 8.00† per cent. in 1923. The total revenue for the year was £6,624,761 (against £6,127,194), and the total working expenditure £2,688,010 (against £2,433,369). The amount available for capital charges was £3,901,960 (£3,728,939). Interest and dividends absorbed £1,972,214† (£1,829,602†), and £1,897,270† (£1,638,261†) was transferred to reserve funds or expended on capital works, making a total of £3,869,484† (£3,467,863†). At the end of the year reserve, renewal, &c., funds showed a total of £8,694,886† (£6,986,998†).

Table 7 gives the average rate of interest and dividends paid by the London companies in each of the 24 years from 1902 to 1925. In the last year the total average dividend was 7.97 per cent. (compared with 8.22 per cent. in 1924 and 8.07 per cent. in 1924). The highest rate (16.12 per cent.) was paid by the Notting Hill Co. and the lowest (4.72 per cent.) by the Kensington and Notting Hill joint station. Up to the end of 1925 premiums raised by the London companies on the issue of capital totalled £1,013,022, the bulk of which was transferred to reserve funds. Another table shows the annual capital expenditure of each of the London municipal and company undertakings for the years 1919-1925. The main feature of this is that whereas in 1923-24 the respective expenditure of municipal and company concerns was £1,087,483 and £2,169,714, in 1924-25 it was £1,103,580 and £5,931,695. The large increase in the company figure is traceable to the County of London Co., whose expenditure during 1925 was £3,871,604. St. Marylebone led the local authorities with £165,600.

The next table shows the provision for depreciation or its equivalent made by each of the London undertakings at the end of the year 1924-25 or 1924. In the case of the companies this shows the state of the reserve funds at the end of the year. In one case (the County of London Co.), the amount stood at over £2,000,000, while the City of London Co.'s figure was £1,768,694, and that of the Metropolitan Co. £1,206,864. In the case of the borough councils the total loan repayment is shown. St. Marylebone, with a total capital investment of £2,713,804, is recorded to have repaid (or provided for the repayment of) £834,486. It is pointed out that the real value of this table can only be gauged when a number of factors are taken into account.

As usual, a large section of the report (12 pages) deals with charges for supply. The lack of uniformity in this respect makes fair comparison impossible. No fewer than 22 different methods of charging are in force and comparison can only be made within each class. With the spread of the two-part method, it is not always fair to assume that flat rate charges give a true indication of the level of prices fixed by an undertaking, but it is the only system which is employed by all undertakings. Then, again, the flat rate shown for an undertaking is sometimes merely the first step of a sliding scale; in the case of lighting, at least, a few domestic consumers, we believe, qualify for the further steps. With these points in mind we can examine the flat rate tables. The lighting rates, it is seen, vary between 4d. per kWh in respect of six undertakings (five municipal) to 11d. in the case of two companies. Ninety-three charges shown give an average rate of 6.75d. per kWh. In the preceding year the average of 85 charges was 6.9d. per kWh (min. 4d., max. 1s.). The table giving flat rates for power contains a record of 74 charges (some, again, the first steps of sliding scales). The lowest is 1d. per kWh in three undertakings (two municipal), and the highest is 7d. in the case of two companies, in each instance the first step of a sliding scale. The average rate is 2.81d. per kWh. The last report gave an average of 2.95d. per kWh for 72 undertakings (min. 1d., max. 7d.). Heating and cooking flat rates number 90. In this case a charge as low as ¾d. per kWh is given (Wimbledon, summer quarters), and there were 15 undertakings with a charge of 1d. per kWh (three companies). The highest rate was 6d. (company), and the average of the 90 was 2.07d. per kWh, comparing with 2.2d. per kWh the average of 85 undertakings in the last report (min. 1d., max. 6d.).

Assuming that these flat rate figures afford an indication of price-level changes, the decreases in charges were as follows:—Lighting 2.17 per cent.; power 4.75 per cent.; and heating and cooking 5.91 per cent.

In another section the annual sales of energy by each undertaking are detailed for five years. With the 1924-25 figure is given the percentage increase above the preceding year. The greatest improvement among the municipalities was shown by Bermondsey (31 per cent.); Wimbledon was very close (28 per cent.). In the Metropolitan area, Stepney's sales only rose by 6 per cent., but in the outer area there were three below this. The best showing among the inner London companies was that of the County of London Co. (20 per cent.), but, in outer London, there were several better than this—the Egham and Staines Co. showed an increase of 59 per cent. On the other hand, two of the outer London companies reported decreases (12 and 6 per cent.). The overall increase for all undertakings was 14 per cent.

This concludes the report proper, but there is a valuable appendix bringing the statistics for the companies up to the end of 1925. The information given may be briefly summarised as follows:—Plant capacity at end of year 528,940 kW (generating) and 140,160 kW (transforming); maximum demand 419,739 kW; number of consumers, 214,873*; total connections, 827,341 kW; overall load factor, 21.1 per cent. (max. 25.7, min. 7.7); energy sold, 610,615,295 kWh (traction, 23,540,418 kWh); capital expenditure at end of year £35,417,261; capital called up, £26,428,017; average rate of dividend and interest, 7.95†; total revenue, £7,090,837; working expenditure, £2,735,041; available for capital charges, £4,306,410*; capital charges, £4,287,521*; total of renewal, reserve, &c., funds, £10,338,601*.

* Incomplete totals.
† Calculated on incomplete totals.

The Telephone Service.

Development Statistics relating to the North-East Coast, North Wales, and Birmingham Districts.

ANNUAL reports to the Telegraph and Telephone Advisory Committees (copies of which have been sent us by Mr. J. R. M. Elliott, superintending engineer, Northern District, P.O. Engineering Department) show that during 1926 development in the Northern District was as follows:—

Northern Development.

NEWCASTLE-UPON-TYNE.—The gross increase in telephone stations was 4,082; there were, however, 2,229 cessations, making a net increase of 1,853 stations, equal to 5.8 per cent. Of the new services added, an average of 55 per cent. was completed within one week of receipt of the order, and 70 per cent. in two weeks. An analysis of statistics is as follows:—

Exchanges	117
Telephone stations (total)	31,666
Residence rate stations	4,158
Call-office stations	474
Street kiosks	48
New exchanges, rural	23
Rural party-line stations	90
Rural railway stations	1

In the Newcastle area considerable progress has been made with the preliminary work in connection with the introduction of automatic switching, and several new buildings for housing the equipment have already been completed. Similar progress has been made in the Sunderland area. New exchanges were opened at six places during the year, and arrangements made to open others. Switchboard extensions have been made in 21 cases, and conversion of the Newcastle City exchange to modern common-battery working improved operating facilities. The construction of a new exchange at Durham will be put in hand immediately the new premises are ready; the switchboard will be of the latest common-battery type. The introduction of automatic working in the Gateshead area will involve the opening of an independent exchange at Low Fell, and a temporary manual exchange is about to commence operation. In addition, consideration is being given to the provision of new building accommodation for exchanges at 12 places. The number of originating local and fee junction calls for 1926 in the Newcastle-on-Tyne district exceeded 28,800,000 and the trunk calls 2,316,000, in each case an increase on the figures for the preceding year. The number of written complaints from subscribers in connection with the local and junction working was 2.3 per 100,000 calls, and for trunk working 5.6; 69 additional trunk and junction circuits were brought into use. The average speed of answer by telephonists was 5.6 seconds, the percentage of calls answered in 5 seconds was 65 per cent., in 10 seconds 91.2 per cent., and in 20 seconds 99.2 percent., while the average time taken to obtain a reply from subscribers on local and junction calls was 31.4 seconds. The permanent Newcastle repeater station at Kenton will shortly take the place of the temporary station now functioning, and at Catterick another on the same line of communication will be brought into service concurrently. Private branch automatic exchanges in subscribers' offices are growing in popularity, and in the Newcastle district the total number was five. The main-line underground trunks and telegraph lins increased by 2,523 miles to 43,342; and underground local line (subscribers) by 10,850 to 66,666 miles.

MIDDLESBROUGH.—The number of telephone stations in use was 11,264, an increase of 750; of the new services added, an average of 50 per cent. was completed within one week of receipt of the order and 70 per cent. in two weeks. A total of 27 new call offices were opened, six in town sub-offices, 19 in rural sub-offices, and 2 at railway stations. The number of street kiosks was also increased by 17 to a total of 37, and three further kiosks were in course of erection; the total number of call offices (including kiosks) was 261. An additional feature recently established in this district by the police authorities was the provision of telephone police boxes at various points in the larger towns; in certain areas they may be used by the public to call the police, fire brigade, or ambulance headquarters, and the total number of such boxes was 7. Improvements in switching equipment were effected in various parts of the area, and in sparsely-populated districts two new rural exchanges were opened, while the establishment of three additional rural exchanges was in hand.

The conversion from manual to automatic switching at West Hartlepool and Hartlepool took place in September, 1926, and the policy of extending underground conductors continued; additional trunk lines were completed and considerable progress was made in the Middlesbrough telephone district in the extensive preliminary work which is necessary in connection with the general introduction of automatic switching. At Hartlepool and West Hartlepool the total of 1,105 subscribers are highly satisfied with the change, and agree that a much superior service is rendered by the new system.

The existing automatic exchange at Marton, which provided for 100 subscribers, is at the present moment in course of extension to provide accommodation for a further 200 subscribers' lines. At Middlesbrough, Stockton, and Linthorpe new buildings for the accommodation of the new automatic exchanges are expected to be completed in the early part of this year. The number of effective trunk calls brought to account for the quarter ending December 31st, 1926, was 287,442, an increase of 3.2 per cent. The number of telegrams received by telephone decreased to approximately 33,000, as against 40,400 for the corresponding period in 1925. The approximate daily average number of originating local calls was 11,990, being an increase of 10.3 per cent.

Midland Statistics.

The abstract of the report which follows (a copy of which has been sent us by Mr. T. Plummer, superintending engineer, North Wales District, deals with the development of the service in the Birmingham area during 1926.

BIRMINGHAM.—The area covers 700 square miles and extends from Brownhills on the north to Bidford on the south, and from Kinver on the west to Coleshill on the east. Telephone stations totalled 57,919, representing an increase equal to 9.89 per cent. for the year, which is lower than that for the previous three years, and is doubtless due to the general depression in trade. The appreciation of internal systems in large stores or offices is indicated by the fact that during the past year approximately 1,800 telephones were provided for subscribers already hiring an installation consisting of two or more telephones. Subscribers' private automatic exchanges provided during the year totalled 16 installations, and there are now 813 such stations working in the district; 1,630 stations were installed during the year at private residences, making a total of 9,810. The demand for call office facilities is growing rapidly, and 142 additional call office stations were installed, making the total 642; of that figure 260 are street kiosks.

The number of local calls made in 1926 was 50,600,850, an increase of 17.7 per cent. The number of trunk calls increased by 9.6 per cent. to 3,362,978, and the number of telephone telegrams dealt with was 744,828, which shows a decrease of 5.1 per cent., due partly to the reduction in betting telegrams since the introduction of the tax on betting transactions.

Partly owing to the extensive operations of laying ducts and the drawing-in of cables carried out in 1924-25 there was not so much need for expansion in this direction during 1926; 3,108 miles of wire was brought into use for trunks and telegraphs, 29,828 miles for subscribers' telephones, and 13,728 miles were added in reserve for future extensions under all classes of service, making a grand total of 225,370 miles. Overhead wires erected during the year amounted to 1,548 miles, bringing the total up to 23,817 miles, an increase of 7 per cent: the comparative increase for underground wires was 11.5 per cent. for main lines and 24.3 per cent. for subscribers' lines.

One exchange was opened during the year at Earlswood with switchboard capacity for 60 subscribers, making altogether a total of 76 exchanges in the district. A new exchange will shortly be opened at Northfield, and extensions of equipment at 30 existing exchanges were carried out. The repeater installation was extended by the addition of 80, bringing the total equipment up to 110, and complete precision testing apparatus has been fitted. The average time of answering subscribers' calling signals for the year was 5.6 seconds, 88.2 of the calls being answered within 10 seconds or less, a considerable improvement on that for the preceding year.

The operating staff numbers nearly 800 telephonists and supervisors, in addition to over 100 male night operating telephonists. Over 113 new entrants to the service passed through the Birmingham Operating School (including six for other districts), and 14 telephonists employed by subscribers for their private branch exchanges were trained. The total engineering staff employed in the construction and maintenance of telephone and telegraphs in the district during the year reached 955, in addition to an average of 245 workmen employed by contractors in laying conduits and other work.

North Wales District.

In the Chester, North Wales, and Hanley area during 1926 some 2,939 telephones were added during the year bringing the total to 31,786. The number of effective trunk calls was 3,226,982, or 12.5 per cent. increase; telegrams passed over the telephone totalled 350,000; local effective calls amounted to 13,583,429, or 3.2 per cent. increase; 103 additional trunk and junction circuits were connected. Public call offices and kiosks increased by 53 to 774, and additions to the underground plant cost £68,600. During the year 2,335 miles of wire was brought into use for trunks and telegraphs, 11,107 miles for subscribers' telephones; 495 miles were used from the reserve for future extensions under all classes of service, leaving a balance of 18,590 miles of wire available for this purpose. The grand total of wires for all classes of service existing amounts to 89,142 miles. Overhead wires erected during the year amounted to 2,846 miles, bringing the total for the combined district up to 60,939 miles, an increase for the year of 4.9 per cent. Attention may be directed to the comparative increase of 13 per cent. for the main lines and 28.3 per cent. for subscribers' lines underground.

Fifteen new exchanges, making a total of 294 in the district, were opened during the year. Extension of switching equipments were carried out at 77 exchanges, the total additional accommodation being for 3,250 lines. The new automatic exchange at Shrewsbury, opened in January, 1926, is giving very satisfactory service.

A New Type of Tramway Controller.

The Cam-operated Contactor Pattern introduced by the Metropolitan-Vickers Co.

THE ordinary drum type controller, which until recently was the only type used in tramway work, has, within its limitations, given excellent service. The adoption of more powerful motors and higher car speeds has, however, increased the maintenance cost of control gear and shown the drum type to be already inadequate to meet present-day requirements.

In approaching the problem it is necessary to keep in view certain fundamental requirements: the mode of operation must follow closely the present method with which drivers are familiar and, consequently, the position and movement of the control handles must be similar to those of the well-known drum controller. Limitations of size and weight are also important, and the all-important maintenance cost must be satisfactory. An important contribution to the solution of this problem is provided by the recent development by the Metropolitan-Vickers Electrical Co., Ltd., of a tramway controller in which the hitherto universal drum and finger contacts have been replaced by cam-operated contactors. Controllers of the new type have been thoroughly tried out under severe service conditions, and have both reduced and simplified maintenance work, and have shown that they are capable of service for which controllers of the drum type would be quite inadequate. Whilst contactors are a new feature in tramway controllers, it is worthy of note that their introduction has not been accompanied by an increase of cost, but by a reduction in size and weight for a given capacity.

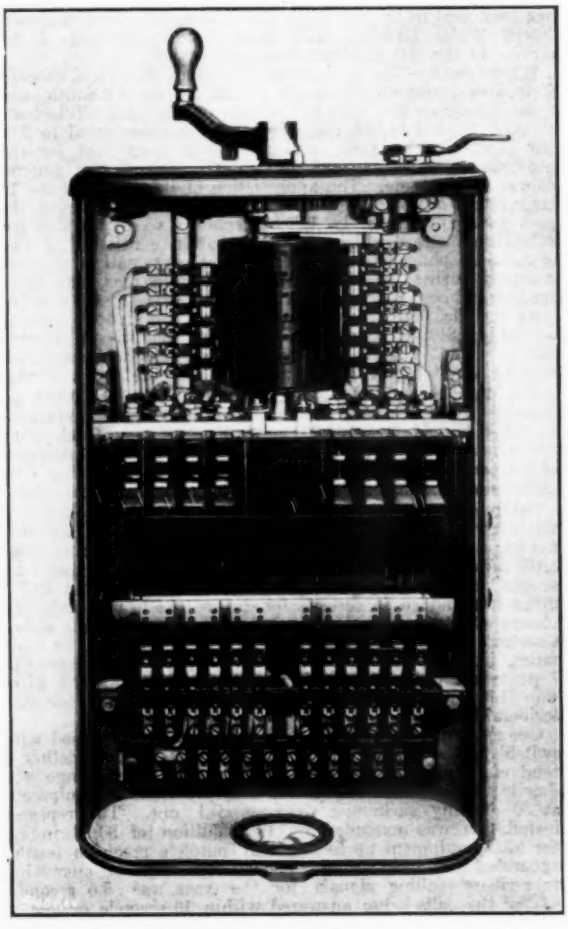

Fig. 1.—"Metrovick OK-B" Controller without Cover; Arc Shield Closed.

In external appearance the new controller is very similar to the ordinary type; its interior is shown in fig. 1. All current-rupturing is done by eight contactors mounted on a horizontal shaft and operated by cast-iron cams clamped upon an insulated steel shaft of square section, the latter being driven with the aid of cut-steel bevel gears by the main controller handle; the arrangement of these parts is shown in fig. 2. Power and brake connections are made, without arcing, by a quadrant arranged horizontally below the contactors and rotated by mechanism fixed to the camshaft in such a way that it is positively held in the power, brake, or off positions. The forward and reverse drum is mounted loosely on the control spindle above the contactors; it is constructed of Bakelite, secured to a cast-iron spider, and is operated by a separate handle that is interlocked with the main controller handle to meet all requirements for normal running in either direction. Cutting out a defective motor is provided for by extra positions on the reverse handle. Any of the usual combinations of rheostatic and magnetic braking can be arranged for and a notch-by-notch device can be fitted to the main handle if required.

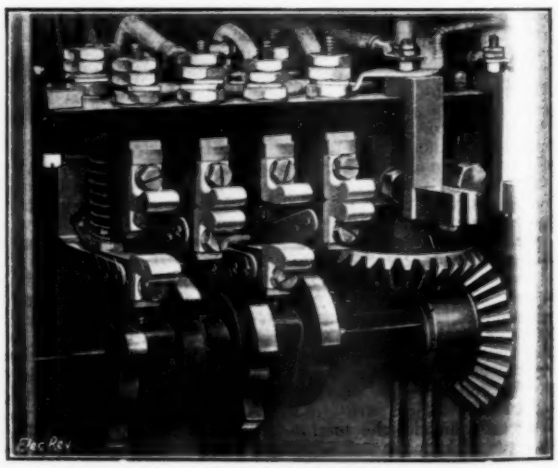

Fig. 2.—Contactors and Cam Mechanism of Controller.

When the arc shield is closed, as shown in fig. 1, the fireproof insulation forms a separate cell-like enclosure for each contactor. Closing the arc shield also carries into position the blow-out coils and core plates; the contacts for the blow-out coils close the main power circuit, so that the controller cannot be used without the arc shield in position. Important advantages are offered by the new design: not only are contactors in themselves claimed to be more effective than finger contacts for arc rupturing, but the wear on contacts is still

further reduced by the more effective arrangement of blow-out devices which is possible with contactors; further, only one

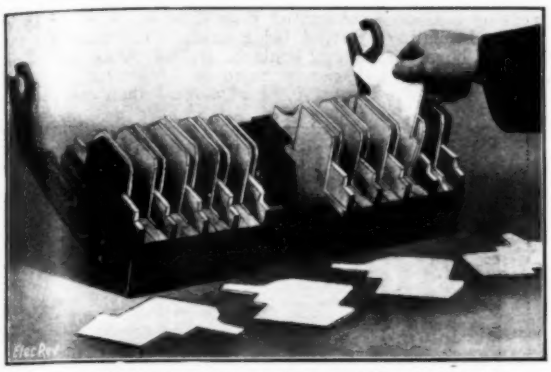

Fig. 3.—Arc Shield, showing Simple Method of Renewing Partitions.

kind of arcing tip is used, the tips do not get burnt at the point of fixing, and replacements are made more easily and quickly. Fig. 3 shows how the partitions of the arc shield can likewise be renewed with a minimum of trouble. Each partition is held in a slot, from which it may be withdrawn and a new one inserted in a moment, no further fixing being necessary; thus renewable parts are small, simple, few in number, and easily replaced. Accessibility of all parts has been facilitated: the arc shield when swung back can be lifted off bodily, and the contactor and camshafts can be removed by simply slackening their bearings; the terminal board being at the base of the controller, all incoming wires terminate at that level, a much more convenient arrangement than the usual side connections.

The anticipated improvement in operation and reduction of maintenance costs are claimed to have been fully realised in operation in the last three years, during which period some difficulties such as are inevitably met with when introducing a new design have been overcome. Since 1922, when the first contactor controllers were put into service, four hundred have been supplied and are now in successful operation under the severe service conditions of the London L.C.C. tramways, and many others have been installed on other systems. An important order was recently received by the Metropolitan-Vickers Electrical Co. from the Leeds Corporation for tramcar equipment, including three hundred controllers of this type, and a considerable number have been already installed and are operating satisfactorily. Indications are that the advantages of the contactor-type of controller will appeal to tramway engineers.

New Electrical Devices, Fittings and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Small Electric Oven.

Arising out of the article published in our issue of December 31st last, "The Trials of a Housewife due to Trials of Electricity," by May M. Cramp, we have received from the WINDSOR ELECTRIC RANGE CO., Windsor House, Victoria Street, London, S.W.1, some particulars of its product, the "Windsor" electric oven, fig. 1. This is a particularly suitable apparatus for use in the small flat, or where space is limited. It has a low loading, 660 W, and, it is claimed, will provide for a two-course dinner for four to six persons for a consumption of only ¾ kWh. It is constructed on mass production lines, and is suitable for supply pressures from 200 to 250 V. The heating elements are claimed to be particularly robust and designed for exceptional durability. Top and bottom heating are provided, four-fold circuits being

Fig. 1—Small Electric Oven.

arranged in each case, so that should a coil fail, even during the process of cooking, there is ample heat to continue the operations satisfactorily. The cooking space is 13 in. by 10 in. by 12 in. Three-heat control is provided. The apparatus was shown at the Exhibition of Inventions, Central Hall, Westminster, in October last, and was briefly referred to in our issue of November 5th, 1926.

An Improved Ironclad Switch.

An addition to the range of switchgear of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is the D.B. minor d.p. switch with fuses, fig. 2. It is mounted in a cast-iron case with external fixing lugs, and suitable for 10-A loading at 500 V, or 15-A at 250 V. This device has been specially designed to meet the increasing demand for inexpensive but efficient switchgear suitable for lighting and heating circuits in house-service and similar installations, and also for small power circuits in factories and workshops. The apparatus can be rendered weatherproof by inserting a gasket in a groove in the lid. It is provided with positive quick-make-and-break actions, controlled by a powerful non-corrosive spring which is in compression only during the operation of the switch. The switch blades are of hard-

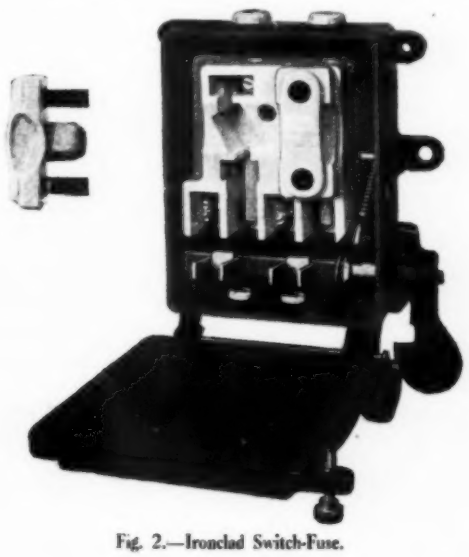

Fig. 2.—Ironclad Switch-Fuse.

drawn copper firmly secured to a square-section steel coupling bar, which is insulated throughout its length by bakelite. The fixed contact blocks are of brass with two clamping screws, and have phosphor-bronze side pressure wings, all the parts being of ample current density. The fuse carriers are fitted with heavy-section brass blades which engage with brass contact blocks having phosphor-bronze side pressure wings. The fuse wire passes through an asbestos tube fixed in the body of the holder, and when in position is situated low down in the deep arcing chamber in the base. There are two cable inlets at the bottom of the case, and two at the top, all being wood bushed. The unit is of liberal design and substantial construction throughout, and complies in every respect with the H.O. Regulations.

Another Internally Frosted Lamp.

MESSRS. SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, London, E.C.4, inform us that they have recently introduced a new size of "Purlite," internally frosted lamp, of 15-W capacity, to meet the demand for a low-power unit suitable for the usual lighting supply pressures. This is available and suitable for any pressures up to 260 V. "Purlite" gasfilled lamps are now supplied in 40-, 60-, 75- and 100-W sizes, and "Purlite" vacuum lamps for 15 and 25 W.

Machinery Fault-Detecting Apparatus.

What should prove very useful to all engineers in charge of running machinery is the Bin-Aural apparatus which has been developed by the CAPAC CO., LTD., 11, Willow Avenue, Barnes, S.W.13, for the audible detection of mechanical faults and comparing the running conditions of various parts. The apparatus consists essentially of a stethoscope, which is used in conjunction with specially designed sound reproducers for internal or external sounds. For internal work the "Tectoscope" is employed; a metal rod is screwed into this, and by applying the free end to the external part of the bearing or other part to be tested, the sound emitted is reproduced in the stethoscope and conveyed by means of specially designed connecting tubes to the ears. By means of a boss, angles may be introduced in the conductor rod, and a special joint serves for various sizes of rod up to ¼ in. section for distance work. It is claimed that with ¼-in. mild-steel rod long runs up to 100 ft. may be satisfactorily employed. For external work the sound is reproduced by means of the "Tectophone"; this carries a small mouthpiece, which is held near the part to be tested. This is particularly suitable for testing gearing for tooth noise; leakages of gases may also be detected in this way. An important feature of the apparatus is the provision for comparison testing, one bearing, or other part, with another. A junction in the tube in this case serves for two "Tectophones" or "Tectoscopes," or one of each. By first applying one only, and then the other in addition, the sound difference can be defined and the running conditions compared.

A Unit-Type Feeder Pillar.

A unit-type feeder pillar is being made by MESSRS. JOHNSON AND PHILLIPS, LTD., Charlton, London, S.E.7, and figs. 3 and 4 shows one of a batch of seventeen which have recently been supplied to Pudsey Corporation.

The casting is of ample strength, and the pillar is well ventilated and embodies a patent locking device, consisting of two locks operating together, for preventing unauthorised persons from opening the door. Each way of the actual distribution unit is complete in itself, the cable box, link, and fuses being mounted vertically on a pair of steel rods, and the complete equipment can be removed to facilitate jointing. The cable boxes are designed to reduce the time required to connect up the cable to a minimum, and the porcelains are fitted with stems to avoid the necessity for bringing out the cable tails. No copper castings are used either in the box fittings or in the fuses, a maximum conductivity thereby being assured. The fuses and links are insulated from the steel supporting rods by means of substantial porcelains, no slate or hygroscopic insulating material being used. The porcelain fuse holders have self-aligning contacts, and are fitted with Zenal fuse elements which can be rated to "blow" at a current much nearer the normal full-load current than can ordinary

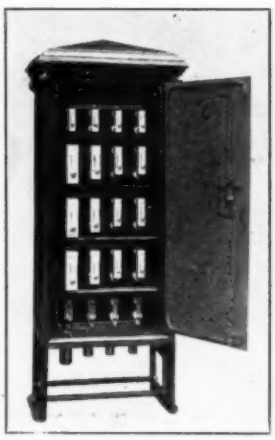

Fig. 3.—Feeder Pillar, Front.

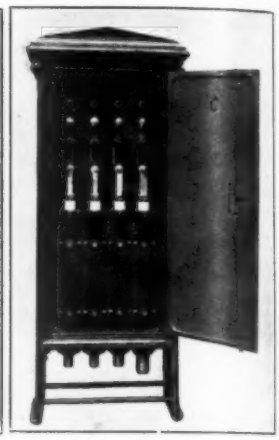

Fig. 4.—Back View.

copper fuse wire. B.E.S.A. clearances are obtained between phases and to earth, and fireproof barriers are fitted between fuses of different polarity. The pillar illustrated is for use on a three-phase, four-wire system, with cables having a fifth core for street lighting service.

A Commutator Lubricant.

We have received a sample of Komm-Glaze, a new commutator lubricant which is to be put on the market by the RAY MANUFACTURING CO., Fishponds, Bristol. It is prepared in the form of sticks of about ½ in. diameter, and is of a substance closely resembling ordinary candle wax, but smoky in appearance. It is claimed that the use of this lubricant lessens the contact drop, increases the conductivity and the life of the brushes and commutator, and produces a pleasing "copper brown" surface on the commutator. It is guaranteed that the substance will not react or carbonise under any circumstances.

A Small Hydro-Electric Plant.

Electricity Supply to a North Nigerian Tin-Mining Undertaking.

THE Northern Nigeria (Bauchi) Tin Mines, Ltd., is fortunate in having acquired the use of a waterfall some 12½ miles distant from its property for supplying power for the mines, and a hydro-electric station has been established which is now supplying 2,000 kW during the

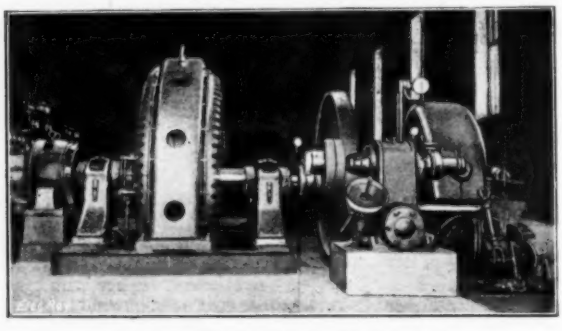

Fig. 1.—500-kW Hydro-Electric Generator.

greater part of the year. The power thus obtained has resulted in a great reduction in the cost of mining, and has enabled the company, without increasing its staff, to double the output of tinstone with highly satisfactory results.

In the power house at Kwall, 700 ft. below the edge of the plateau, there are four generating sets, of which one of 500 kW was supplied by the Swedish General Electric Co., Ltd., and is driven by an Armstrong-Whitworth turbine, fig. 1. Power is generated at 550 V and stepped up to 22,000 V for transmission, over very rough intervening country, to an outdoor sub-station situated at the strategic centre of the property. This is designed for an ultimate capacity of 2,000 kVA, but is equipped at present with two 450-kVA Asea transformers. The supply is here reduced to working pressures of 2,200 V for the large pump motors, and 400-230 V for the small motors and lighting. The lighting supply has proved an important feature of the plant, and has resulted during night operations in a great saving of tin which would otherwise be lost in the tailings.

A further sub-station has since been erected 2½ miles from the main one on an important tin-bearing ground which was previously worked by oil-engine-driven pumps. This houses a 450-kVA Asea transformer.

The climatic conditions on the Nigerian plateau are especially severe for electrical apparatus. In the winter, the air is intensely dry and cold, while in the summer it is the extreme opposite, being humid and warm to an uncomfortable degree. In the dry season, and as a result of mining operations at all times, a great deal of fine sand is blown into the machinery. In spite of these abnormal conditions, however, both plants have given great satisfaction.

Electric Furnaces in Non-Ferrous Metallurgy.

By DONALD F. CAMPBELL, M.A., A.R.S.M.

(*Abstract of a paper read before the* Institute of Metals.)

SINGLE furnaces of 4,000 to 10,000 kW are now engaged in smelting pig iron and in the manufacture of carbide, while probably about half a million kW of furnace capacity is engaged in melting metals, to which must be added a million or more kW of generating machinery used for making aluminium and smelting ferro-alloys.

There are a few general principles which seem necessary in the design of efficient electro-metallurgical plant. It is essential that equipment should first satisfy the requirements of the metallurgist, and that the electrical engineer should meet his demands. The electrical engineer should then be given a free hand and allowed to purchase only the very best equipment. Numerous failures of electric furnaces are due to metallurgists interfering in electrical equipment, or electrical engineers designing unpractical metallurgical appliances, while purchasing departments have not infrequently caused trouble by buying inferior equipment for the arduous service inseparable from metallurgical work. For almost every group of alloys an electric furnace of special design is required, and for any particular metal, the type of furnace to be selected may depend on the hours of work.

The Ajax-Wyatt furnace is now the standard melting equipment for supplying brass mills. It consists of a cylindrical steel vessel lined with brickwork or rammed refractory material, below which a transformer is suspended, the secondary of which is a vertical V-shaped channel arranged so that it passes round the primary winding and iron of the transformer. Heat is generated in this secondary circuit and the metal is well circulated by electrical forces, so that hot metal is constantly forced out of the secondary, and cooler metal takes its place. This mixing effect is due to three forces—namely, convection currents, electric motor effect, and "pinch" effect.

The electrical design of these furnaces requires care, but metallurgically they work with extraordinarily little trouble if the bottoms are properly made and dried. The cost of refractories may be as low as 1s. per ton melted.

The life of the linings varies from two or three months to two or three years, and as the cost of labour and materials for ramming the bottom only costs from £30 to £40, it is clear that this is not a very serious item on an output of 600 to 1,300 tons per lining.

These furnaces are usually run continuously at 60 kW, producing 600 lb. of brass every 60 to 70 minutes, and during periods of idleness the furnace is kept warm with a current consumption of about 8 kWh an hour.

The power consumption when melting 60 : 40 brass in such a furnace should not exceed 220 units per ton, to which must be added the stand-by current consumed during idle hours.

Although the efficiency resulting from the generation of the heat within the metal itself is remarkable, its limitations are serious, as suitable refractory materials have not yet been found to produce linings for metals of high melting point.

A considerable economy in the cost of making brass in this furnace is due to the accuracy of composition attainable, so that the usual margin of copper in excess of the specification can be reduced.

In the Ajax-Northrup furnace, the newest form of melting equipment, the metal is heated by induction in a high-frequency field, wherein there is no need of iron, nor of a secondary of the type used in normal frequency induction furnaces. The furnace itself is of simple construction, consisting only of a crucible, round which a spiral inductor coil is wound, with the narrow intermediate space filled with zirconite or some other heat insulator. Tests showed that 6-cwt. charges of nickel-silver containing about 15 per cent. of nickel could be melted in an average time of 1 hour, the average consumption being just under 350 kWh per ton; 4-cwt. charges of cupro-nickel were melted in an average time of 55 minutes, the average consumption being 448 kWh per ton.

The average life of crucibles in a large number of heats of cupro-nickel and nickel-silver was 58, which was increased to 95 by patching, but it was found to be doubtful whether the delay caused by patching was justified by reduced costs. It requires about 4 hours for the crucibles to cool before patching can be begun, and 6 hours for subsequent drying. The wear on crucibles is normally about 0.75 in. deep after 60 heats of nickel-silver. The conditions of melting in Ajax-Wyatt and Northrup furnaces of normal design are not those suitable for melting aluminium and its alloys, which should be melted in tranquillity.

Experiments are now being made to evolve equipment giving the requisite conditions, but the final form of the most suitable furnace is not yet determined, as all experiments of this type must be made over a long period and on a substantial scale before electric melting can be confidently recommended, and costs of operation and quality of product established.

In some tests in the United States silver was melted at the rate of 10.9 lb. per kWh.

An interesting installation of small units has been erected in Staffordshire to manufacture nickel-iron alloys of exceptional purity to be used for "loading" submarine cables. High-frequency current was produced by mercury spark gaps operated in hydrogen with batteries of condensers for power-factor improvement. Forty-two such units were used and have been operated for many months, both day and night shifts, with satisfactory results.

As compared with "pit fires," this furnace has the advantage of avoiding all contamination from sulphurous fumes and other impurities. Labour costs are reduced, and skilled casters of exceptional strength are unnecessary, while absolute control of heat and complete mixing are obtained. The space occupied by coke and ashes is no longer required, while chimney and furnace repairs are eliminated. Crucible costs are reduced to a fraction of those of pit fires. On the other hand, capital expenditure is considerable, and a skilled electrician is required for rotary machinery. For works operating by day only this furnace has great advantages, though the interest charges are naturally increased by the shorter hours of work.

Discussion.

Dr. H. W. Brownsdon said that from time-temperature curves he had taken while running an Ajax-Wyatt furnace he had found that it required from 50 to 55 minutes to melt the metal, and then a certain amount of superheating was required; the superheating might be 100 deg. or so above the melting point of the metal. He considered the figure of 224 kWh per ton for melting 60 : 40 brass for extrusion billets in a 600-lb. Ajax-Wyatt furnace was reasonable. In the best running conditions he had experienced the metal loss had not been less than 1.1 per cent., and was made up of practically 80 per cent. of zinc represented as oxide. Under average working conditions the loss came out at 1.3 per cent., of which about 1.1 was zinc oxide. It occurred to him that the Ajax-Wyatt furnace needed an arc at the top so that with more heat there the added scrap could be melted more quickly. He considered that there was just as bright a future for the application of electric furnaces to heat treatment and annealing as to melting. In annealing the whole of the energy, except that lost by radiation, could be absorbed into the material, given suitable design, and in an experimental furnace which he had running he had reached the point at which 60 kWh per ton was quite a reasonable current consumption for the annealing of brass; he had no doubt that that could be much improved.

Mr. W. R. Barclay was disappointed that the arc furnace had not received more attention. In arc-furnace melting there were not the same serious troubles as in other electric furnace melting practice with regard to refractories, and there was greater elasticity in choice of refractory materials. Arc furnaces also permitted a certain amount of refining. With proper working the danger of absorption of carbon from the electrodes could be reduced to a minimum. He was not quite sure that purer melting could be obtained with the high-frequency furnace than with any other type. It was remarkable what a high degree of purity could be obtained with the arc furnace, properly controlled. He emphasised the necessity for the close collaboration of the metallurgist and the engineer in design, in order to produce ideal melting plant. The electric furnace gave accuracy of control which was not obtainable with any other type, and the bogie of cost was really not so serious as it appeared to be on paper. One of the great advantages of electrical heat treatment was that one was able to bring the furnace to the work without inconvenience to the operator; when other types of annealing furnaces were used, the cost of transporting material to those furnaces was astounding. In a modern, well-designed, electric furnace one could have a very high standard of insulation, so that a man could work a wire-drawing machine within 2 ft. of a furnace which was annealing the wire at a temperature of 800 or 900 deg., and yet not feel the heat.

Mr. A. Glynne Lobley said that in the Watson furnace, which was English, the electrical portion was out of the way of

the operator, and there was very little fear of breaking the electrodes. He had been faced with the problem of melting aluminium electrically in bulk, and had had to rule out both the arc and the induction furnace. There were several difficulties in the use of the induction furnace for the purpose, including the high conductivity of aluminium, "pinch" effect, and the difficulty with regard to the refractory. He built a furnace using carborundum troughs, with granular carbon as the resistor, and it gave excellent results. Mr. Lobley also referred to a small crucible type of furnace heated by external nickel-chromium resistors. The crucible held 60 lb., the furnace being used for melting aluminium alloys in very small quantities for die casting. The cost of running was rather less than that of the gas furnace which it had supplanted, even though the electric furnace was kept hot all night and used only in the daytime. He had used the star-delta connection for industrial annealing furnaces on 440 V. The dimensions of the smallest furnace were 2½ ft. across and 6 ft. long. In one type of resistor furnace nickel-chromium strip was held in metal supports in such a way that there was no shielding at all, so that hot spots were avoided. The speaker referred to a patented method in which currents of extremely high frequency were applied to bring about surface heat treatment. One could calculate the frequency which was necessary to locate the heating at the surface, and it would be possible to bring about surface heat-treatment where required without having to raise the whole of the material to the required temperature.

Mr. H. H. Hayes quoted figures for a typical week's run of the first Ajax-Wyatt furnaces put down in the Midlands: 98 tons of metal were charged, of which 98.5 per cent. was poured as ingots. The hours of running and melting respectively were 168 and 126. The average consumption per ton of metal charged was 240 kWh, and the total metal irrevocably lost was 2.5 per cent. The supply was at 50 cycles. In a furnace of the same type, but supplied at 25 cycles, the average consumption was 218 kWh per ton. He urged that attention should be given to the design of furnaces in relation to the shape of the articles to be treated. The building of furnaces in the shape of a narrow or shallow trough or tunnel through which straight strips could be pushed or conveyed by conveyor chains would materially increase the efficiency of electrically-heated furnaces.

Mr. Otto Frick said that the problem of finding a suitable lining for non-ferrous metal furnaces did not offer greater difficulties than those already met with and overcome in connection with steel melting, notwithstanding that these difficulties were of a somewhat different character. For brass the problem had been solved already in a reliable and satisfactory way; the lining of the first 120-kW brass furnace in the factory of A. B. Svenske Metallwerken, Vestersa, Sweden, promised a very long life. He described a Frick furnace, which operated at 130 kW, in Sweden, and gave perfect satisfaction in all respects, producing 12 tons of brass of absolutely uniform analysis in 24 hours. Quick transfer of heat and reliable alloying were secured without having to rely upon either "pinch" effect or on a V-shaped channel, simply by utilising the rotary movement of the metal in the heating channel well known to all users of transformer furnaces. In order to keep the 120 kW, 600 kg., brass furnace hot, from 7 to 8 kW was required. The total electrical losses in the furnace and step-up transformer remained at or below 3 per cent.

Dr. Walter Rosenhain, F.R.S., said that the economy of the melting process was not merely a question of the transfer of energy from an electric current generator to the metal; it was also a function to some extent of the rate of loss of heat from the container. If the metal container were of an undesirable shape—for instance, a large ring—it was bound to lose heat unduly fast. If it had to be subjected to a very violent temperature gradient by external cooling, the economy of the process would be likely to suffer. The Ajax-Wyatt furnace seemed to be remarkably free from both these defects.

Mr. Campbell, replying to the discussion, said there was a considerable number of electric furnaces for annealing in this country of which he had experience, some of them being used for the continuous annealing of wire for submarine cables, in which case it was necessary to work to within very close limits, and to anneal in an atmosphere of nitrogen. They were giving completely satisfactory results. The whole of the wire in the Pacific cable, the longest in the world, was annealed electrically. Other furnaces of large dimensions had been erected for the heat treatment of aluminium for the Admiralty, and for various other operations of that sort. In the arc furnace there was a shallow bath and a large slag area. With the high-frequency furnace he had not expected efficient refining, because the slag appeared to be cold, but it was in fact very hot on the under side, and the speed with which the metal was brought into contact with the slag was enormously greater than in any other furnace. He was certain that great improvements would be announced before long with regard to linings. The 600-lb. furnace was suitable for brass mills, but there was no reason why larger capacity furnaces should not be used. Within a month or two furnaces of from 25 to 30 cwt. capacity would be working. The capacity of the individual furnace depended largely upon the size of the shop, the work to be done.

Pulverised-Fuel Firing.

A review of the practice to date in the burning of powdered coal, particularly with regard to its influence on modern boiler design.

By E. KILBURN SCOTT, A.M.Inst.C.E., M.I.E.E.

(*Abstract of a paper read before the* Cleveland Institute of Engineers.)

THE "unit" system of pulverised firing is generally considered the most suitable for applying to existing boilers, including some of the internally-fired type, and it has also a great field for metallurgical furnaces, kilns, and so on. Coal must be dry if it is going to be powdered, because moist coal is difficult to grind, and not safe to store if the free moisture is above 2 or 3 per cent. Coal dryers are usually of three kinds, the rotating tubular type, the vertical type, and the vertical rotating steam dryer.

The first type usually consists of two tubes, one inside the other and upwards of 50 ft. long. The outer tube, which may be 6 to 8 ft. in diameter, is surrounded by a brickwork furnace and has a grate on one side for burning coal to get the necessary heat. The tubes are set at a slight slope from the horizontal, and are rotated slowly, like a cement kiln. The hot gases pass round the outside of the outer tube and then go up the inner tube, the coal being passed along the annular space between them. This type makes a great deal of noise and has the objection of requiring large floor space. The vertical-louvre type dryer is about 10 ft. in diameter and 20 ft. high, and the coal slides slowly down between louvres that permit part of the hot flue gases to pass twice across the path of the coal, and as the gases go through the interstices, they pick up the moisture. The steam dryer is certain in action and the heat can be regulated with great nicety. It consists of a steel casing about 10 ft. in diameter and 20 ft. high, inside of which a number of cast-iron disks are slowly revolved. They are heated with pipes that receive steam from the hollow vertical spindle. The coal is fed in at the top and after making nearly a complete revolution on the first disk is scraped off and passes down a chute to the next disk, and so on. Steam is bled from the main at full pressure, and the heat imparted to the coal causes the moisture to be carried off by a stream of air that is induced through the dryer by a fan, which delivers the moisture outside the building.

One of the best known grinding mills is the "Raymond," which has its rollers inside a horizontal bull ring, set on a cast-iron base-plate, with tangential openings to allow air to pass inside the grinding chamber. The vertical central spindle carries a number of steel ploughs at its lower end to stir up the coal and a spider at the upper end carries the vertical journals of the rollers, of which there are usually four to six. Most modern mills are arranged for air separation, that is to say, the fine particles of coal are swept forward by a continuous current of air, which carries them up to a cyclone, where the particles of coal are swirled away from the air. When grinding coal, the fine powder must be prevented from getting into the atmosphere, and all joints of machines and pipes must therefore be kept tight. In order to prevent wear on the blades of the air fan by the powdered fuel it is now becoming the practice to place the fan in the return air pipe leading to the mill.

In a recent form of feeder, known as the plate type, the powdered coal drops on to a cast-iron plate at the bottom of the storage bin, in which are two apertures spaced diagonally. An agitator revolves over the top of the plate and the pulverised coal passes through the apertures on to a rotor casting which has fingers that distribute it to a Venturi tube, where

it meets a current of air. This air is preheated to prevent coal packing by the condensation of moisture. The vertical shaft carrying the agitator and rotor is driven through a worm and worm wheel by an electric motor, the speed of which can be controlled from a distant switchboard. The amount of coal can thus be regulated at each burner with great nicety. Plate feeders have the advantage of taking less electric power, and there is practically no chance of the coal "hanging," as was sometimes the case with screw feeders.

It is usual for each boiler furnace to be fitted with a considerable number of burners; a boiler burning 6 tons of fuel per hour may have six or eight. Fishtail burners are now the regular shape, and they are usually set about 2 ft. apart in the suspended arch, the flat sides of the burners being at right angles to the front wall. Owing to the draught of the chimney, the resultant flame takes the form of a U, and it is met at intervals in its path by fresh supplies of preheated secondary air, which issues from numerous ports in the front wall. This secondary air is about 80 per cent. of the total.

When the walls of a combustion chamber are covered with water tubes it is possible to have higher flame temperatures. Highly preheated air can also be used, and this is provided by a separate preheater. A special form of burner has been designed, having a separate pipe connection for the preheated air and two deflectors to direct this air into the coal and primary air stream at the moment it leaves the nozzle.

Intensive mixing of fuel and air in the furnace is a leading factor in promoting rapid combustion, for it is necessary to bring the oxygen and carbon together, so that they can combine quickly. By this means temperatures of above 2,500 deg. F. are obtainable.

In order to get turbulence in the flame, designers are turning their attention to special burners; one of these, the "Couch," has the mixture of powdered coal and primary air spread outwards by a cone and secondary air jets, which enter from fan-shaped blades, impinge at right angles against the cone of coal, and give it a rotary motion. Experiments have shown that up to 35,000 B.th.u. per cubic foot of combustion space can be liberated per hour by this form of burner.

When powdered coal has to be transmitted for distances under 100 ft., it is usual to employ screw conveyors. For distances above this pumps or blowers are employed. Powdered coal can, of course, be carried in piping along with sufficient air for its combustion, but this is not very safe, and the usual plan is to transmit it with only just sufficient air to fluidise the opal, as there is then no chance of back firing.

The Fuller Kinyon consists of a rapidly rotating screw to set the powdered coal in motion, combined with a fan to inject air to fluidise it.

At the Ougree Marihage Steel Works, Belgium, a system called the "Quigley" transmits pulverised coal for 2,300 ft. through 4-in. piping which follows the contour of the ground, and at one point has a sharp change of elevation of 33 ft.

The increase in the size of boilers led to the Delrick arch, which has a single layer of firebricks suspended from steel-girder bars. Another form, the Iiptak, has two layers of refractory bricks, the lower layer being suspended from the upper one, which is in turn suspended from the steel structure. The refractory shapes or bricks are usually made of a mixture containing a high percentage of alumina. A boiler now being built for an English power station has water wall tubes to take the place of the flat suspended arch, and two layers of refractory bricks on the top of the tubes to close in the combustion chamber at that point.

The success of the water screen led to the idea of completely covering the walls, and Mr. Murray, chief engineer, Hell Gate power station, U.S.A., introduced the Murray "fin" tube, which has strips of steel, 1¼ in. wide and ¼ in. thick, welded along each side of the tubes so as to give ample space for them to be conveniently expanded into the headers.

The only backing of the tubes is a layer of asbestos about 2 in. thick.

In addition to water tubes, furnace walls are now also being fitted with steam superheater tubes, through which steam circulates at high velocity on its way from the boiler steam drum to the steam-pipe header. Such tubes are also used for superheating low-pressure steam. With furnace walls so built intensive mixing of the pulverised fuel and the combustion air may be increased to almost any extent, and the whole of the combustion space effectively utilised for combustion purposes.

The new power station at Peterborough is to have the boilers and turbo-generators under one roof without any dividing wall between them, and there are also no coal bins over the boilers, the powdered fuel being transmitted from a separate coal-preparation house direct to the boiler burners. When very high pressures are employed it is important to get the boiler close to the turbine, and this can be easily done when it is fired with powdered coal.

A boiler to give 240,000 lb. of steam per hour at a pressure of 1,200 lb. per sq. in., fired with pulverised fuel, has been recently started at the Lakeside power station of the Milwaukee Electric Light and Railway Co. The two steam drums, each 41½ ft. long, and the mud drum, 40 ft., are made from hollow forgings, machined inside and out. The boiler has 1,602 tubes, giving a heating surface of 28,532 sq. ft. After passing through the h.p. turbine, and becoming reduced to 300 lb. per sq. in., the steam is brought back to a reheater in the wall of the combustion chamber, where the temperature is raised to 720 deg. F. Across the furnace bottom there are 35 water screen tubes, giving a total screen area of 245 sq. ft.

The bin for the pulverised fuel has a capacity of 140 tons, and the fuel is fed by 12 screw feeders, driven by six variable-speed motors through 7-in. diameter pipes to 12 burners. The capacity of the feeders is 35,000 lb. of coal per hour, and the volume of the furnace is 30,100 cubic feet. The primary air has a pressure of 15 in. of water and a temperature of 300 deg. F. The secondary air is supplied through burners and ports in the front wall at a temperature of about 500 deg. F. and a pressure of about ½ in. of water.

The front wall of the combustion chamber is fitted with 70 fin tubes, the total area of which is 420 sq. ft.

The total heat-absorption surface of the boiler is 31,969 sq. ft., of which 3,407 sq. ft., or 10.7 per cent., represents the radiant-heat-absorption surface, not including the front row of the boiler tubes.

A boiler now being experimented with at the works of Messrs. Taylor Bros., Ltd., has its combustion chamber entirely surrounded by water wall-tubes, connected by headers, with the boiler drums at the top and bottom, the combustion chamber square, and the four walls covered with Murray fin tubes. The roof consists of plain tubes that connect the steam drums, and there are also four rows of tubes connecting the mud drums at the bottom.

The powdered coal and air enters the combustion chamber through two burners at each corner near the top. The products of combustion pass between the tubes at the bottom, and the gases turn upwards and pass through the superheater and preheater on their way to the chimney.

Tests have shown that about 40,000 B.th.u. can be liberated per cubic foot of combustion space per hour.

A boiler of this design is being made for the Commonwealth Edison Co. of Chicago, to give 125,000 lb. of steam per hour, 300 lb./sq. in., and two others are being made for the Brighton power station.

Scientific and Industrial Research.

Report of the Department for the Year 1925-6.

LAST week the report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1925-26 was published (H.M. Stationery Office; Cmd. 2,782. Price 3s. net). It states that the estimated cost of the programme of research for 1926-27, and of administration, amounts to £142,877, as compared with £380,263 for the previous year. During the year Sir Richard Threlfall, Dr. J. H. Jeans, Sir William Ellis, Sir John Snell, and Sir John Farmer retired from the Advisory Council on the completion of their terms of appointment; Prof. H. C. H. Carpenter, F.R.S., and Dr. G. C. Clayton, C.B.E., M.P., were appointed members of Council. Commenting on ten years' work, the Committee endorses the view of the Advisory Council that in the field of applied research the duty of the Department is rather to stimulate than to replace private enterprise, save in certain directions in which the expenditure of public funds is justified, as in the study of our fuel resources. The fear is expressed that in many cases industry has not investigated the possible applications of new discoveries in pure science likely to lead to new products or processes. Unless research has a practical objective it does not fall within the functions of the Department or, indeed, of industry itself; but industry is undoubtedly concerned with pure research as much as with applied research.

New research associations are being formed and will be assisted. The Committee has adhered to its policy of continuing to assist for a further five years those associations which have done good work, the grants being calculated on a diminishing scale so as to enable the industry gradually to assume full financial responsibility. Amongst other associations whose work has been investigated by independent experts, the British Cast-Iron Research Association has been

offered pound-for-pound grants for three years, and grants at half that rate for a further two years. The Research Association of British Rubber Manufacturers, and the British Refractories Research Association, are also receiving continued assistance. During the year grants to associations amounted to £88,216, and the balance of the Million Fund unexpended on March 31st, 1926, was £429,984. The uncommitted balance of the Fund was £144,647.

Fuel research has been delayed by the difficulties in the coal industry. Several systems of low-temperature carbonisation of coal have been brought to the stage of full-sized construction, and five of these have been tested by the Department. The view of the Royal Commission on the Coal Industry, that a survey of the heat, light, and power requirements of the country was called for, is cordially endorsed. The committee appointed by the Department to examine the Severn barrage proposal has reported in terms sufficiently favourable to justify an extension of the inquiry, and it has been decided to transfer its supervision to a sub-committee of the Committee of Civil Research, which includes members of the original Departmental Committee. The attention given to research as a means of developing the Empire, at the recent Imperial Conference, is mentioned with satisfaction.

The report of the Advisory Council to the Committee surveys the whole field of work covered during the ten years of the Department's existence, and emphasises the necessity of systematic investigation to enable industrial progress to be made; unfortunately, public opinion is not yet fully aroused to its necessity, but there have been many welcome signs of a change in attitude during the past ten years, and more research work is now carried out than ever before. Many prominent industrial firms are rapidly developing their scientific organisations. Greater expansion is necessary and a far greater co-ordination of effort. When an industry consists of a large number of comparatively small and independent firms, these cannot maintain separate research organisations sufficiently large to provide for their needs, nor is it in the general interests of the country that they should do so, for this would involve a great waste of money and effort in the attack of particular problems many times over. There are only two ways out of this difficulty—the formation of large industrial combines, and the encouragement of co-operative research.

Regarding the electrical industry, the Advisory Council says: "The electrical industry not only owes its origin to pure scientific research, but is assisted even now more than any other industry by researches carried out in universities and in Government establishments. Every university encourages the intensive study of electrical science; all the Service Departments spend large sums of money on electrical research, the majority of the results of which are available to industry; the National Physical Laboratory has always had an Electrical Department, and a building and equipment for the special study of high-tension problems is approaching completion. Under the Radio Research Board of the Department investigations have been carried out of direct importance to the electrical industry, and some of the results of the work are already being applied. Grants have also been given to independent investigation for electrical research; in particular, a large grant has been given to the Cavendish Laboratory, Cambridge, for fundamental work on intense magnetic fields. A British Electrical and Allied Industries Research Association has also been formed with the aid of large grants from the Department, and has been engaged for some years now on investigations of general importance to the industry. Finally, in the industry itself there has been a considerable expansion of scientific work since the war. The prominent electrical manufacturing firms have large research laboratories, and we hope that it is only a matter of time before these equal in achievement, if not in size, those of their principal foreign competitors. On the whole, the position is healthy; there is general recognition of the necessity for continuous research if progress is to be maintained independently of foreign countries. The British Electrical and Allied Industries Research Association deserves, however, far greater support from electrical supply companies, for much of its work is of great value to them. To take a comparatively simple instance, the investigations on the safe loading of underground cables, undertaken for the Association at the National Physical Laboratory, have shown the possibility of immediate economies in the electrical supply industry which, according to an independent estimate, are valued at some £250,000 a year. The work of the Association on switchgear and overhead transmission lines is of greater direct importance to supply companies than to manufacturers. We trust that there will be a far greater effort on the part of the supply undertakings to maintain the Association on an adequate financial basis. It will certainly be difficult to justify any continuance of Government grant to the Association after the present grant period ends in September, 1930. As we have said, the electrical industry receives more support in relation to its size and importance from independent and Government research than any other British industry. It has been comparatively prosperous throughout times of great difficulties in other industries, and there is every sign of a continuance of its prosperity for many years. It will only be really healthy when it relies on its own efforts to meet foreign competition, and does not look for further direct support from the taxpayer to aid its scientific development."

Dealing with industries generally, the Advisory Council lays stress on the value of co-operative research in the widest sense, and emphatically records the opinion that the importance of a steady scientific policy increases in times of adversity. The expenditure required to produce results of direct industrial importance is trivial in relation to the value of the total output of an industry, and the view is expressed that the system of voluntary contributions to co-operative research associations is inadequate; efforts are being made by some associations to introduce some kind of voluntary or compulsory levy on raw material, on manufacture, or on individual outputs.

In the class of so-called "key" industries, such as the manufacture of scientific instruments and of optical and scientific glassware, the expenditure on scientific and technical research required to maintain a high standard and continuously to introduce improvements is comparatively very high, and these have been helped since the war by a tax on imports and by considerable grants of money for scientific research.

Summarising its general policy, the Advisory Council holds that the Department is not justified in spending public funds continuously on work which is for the special benefit of particular industries, and which should be carried out by the industries themselves if the results are to be applied efficiently and quickly. The duty of the Department in these directions is rather to stimulate than to replace private initiative, and particularly to seek to reduce the gap between new scientific advances and industrial applications. Co-operative research by means of research associations has been encouraged by financial grants over a limited period, and the results show that this policy has been a wise one. It has led not only to actual achievements which have been applied in industry, but it has had a great effect in bringing the leaders of the industry face to face with the need for research, and thus encouraging them to provide more directly for scientific work needed for their own special requirements.

In all the measures adopted by the Department to carry out or to promote industrial research, the primary purpose must be to secure the application of scientific knowledge in industry. It is one of the most important parts of the Department's own research organisation to establish utilisation sections for promoting the application of scientific and technical information in industry. The same function must be discharged by research associations wherever they exist; indeed, this function is regarded as being in many cases perhaps the most important function which the research association can discharge.

A large part of the report is devoted to a summary of the work done under the various research organisations of the Department during the year 1925-26, including the National Physical Laboratory, the Fuel Research Board, the Engineering and Physics Co-ordinating Research Boards, the Radio Research Board, and the Illumination Research Committee. In nine Appendices particulars are given of the Research Boards and Committees of the Department, grants to research workers, aided researches, finance, existing Research Associations, research in other parts of the Empire, publications by researchers and Government employés, and departmental publications issued during the year.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Bognor Gas and Electricity Bill.

The Bill promoted by the Bognor Gaslight and Coke Co. was considered by a Committee of the House of Lords, over which Earl Russell presided, on March 22nd.

Mr. Rowand Harker, K.C., said that the company supplied both gas and electricity, and the main objects of the Bill were to enable the name of the company to be changed to "The Bognor Gas and Electricity Co."; to raise additional capital; and to extend the limits for the supply of gas and electricity. The amount of stock authorised up to the present time was £104,700, and the Bill authorised £100,000 additional capital, and increased borrowing powers.

Originally there were a number of opponents, but agreements had been reached in most cases. There remained, however, the petition of the Westhampnett Rural District Council with regard to electricity supply. Part of the area of the rural district was within the existing limits of supply of the Bognor Co., and it was proposed to include further parishes. The issue would emerge as to whether the company should be put under the obligation to supply electricity in certain places, no matter what the cost would be to the company, irrespective of whether that supply would give any proper return on the capital outlay, and irrespective of what the effect of such an obligation would be upon the existing consumers of the company. At present there was no supply of electricity in Arundel, but Arundel wanted a supply, and the company was anxious to give it. The generating station at Bognor was small, and therefore the company was endeavouring to obtain a bulk supply, through the Chichester Corporation, from the Portsmouth Corporation. A new h.p. main would pass within fairly reasonable distance of certain small townships within the Westhampnett Rural District, and if and when the company was satisfied that a reasonable demand for electricity

existed in those townships, it was proposed to tap the main and supply them. The petition of the Westhampnett Council pointed out that for over fourteen years the company had failed to exercise its powers in any of the parishes in the Rural District, although there was a demand. It was suggested that the company should be placed under an obligation to lay mains in the parishes at present within the area of supply within two years from the passing of the Bill. The company had inserted a clause, which it asked the Committee to approve, providing that if, after the expiration of five years from the passing of the Bill, it had not, in the opinion of the Electricity Commissioners, laid suitable and sufficient distributing mains for the supply of electricity in any parish added by this Bill to the existing limits, the local authority or any company or person could apply for powers to give such a supply, and providing for the repeal of the company's powers. That did not apply to the parishes already within the company's limits of supply. Since 1888 the Rural District Council had had power to apply for an Order enabling it to supply in the whole of its district, but it had not exercised that power.

A report from the Minister of Transport pointed out that in cases where extensions of area were sought by Special Order under the Electricity (Supply) Acts, it was usual for promoters to be placed under an obligation to carry out within two years a reasonable amount of compulsory works in the more populous portions of the extended areas, unless justification were shown that such an obligation should not be imposed. Counsel said that a clause had been inserted in the Bill placing an obligation upon the company within two years to lay down distributing mains reasonably suitable and sufficient for the purposes of a general supply of electricity in certain streets in the borough of Arundel. The report also pointed out that an application had been made to the Electricity Commissioners by the Electric Supply Corporation, Ltd., for a Special Order authorising the supply of electricity in an extensive area embracing the borough of Arundel, and some of the parishes it was now sought to add to the area of supply of the Bognor Co. Counsel informed the Committee, however, that the Corporation had not opposed the present Bill, and the Bognor Co. had not heard from it.

After hearing a great deal of evidence, the Committee decided that the parishes of Tangmere, Boxgrove, Eartham and Upwaltham should not be included within the company's limits of supply; that the company should be compelled to lay distributing mains in certain streets in Aldwick and Felpham within two years, and in certain streets in the parish of Yapton within three years. The gas clauses were approved.

Hastings Tramways Bill.

This Bill, which provides for the substitution of trolley vehicles for tramways by the Hastings Tramways Co., was approved by a Committee of the House of Lords last week. There was opposition from the Hastings Corporation, which expressed a preference for motor-'buses rather than trolley vehicles. It suggested that the company should withdraw the Bill, on the undertaking that the Corporation would not oppose the preamble of a Bill enabling the company to run 'buses in Hastings. The company could not accept this, for financial and other reasons.

Colchester Corporation Bill.

This Bill, which proposes to substitute trolley vehicles for the existing tramways in Colchester, was approved by the Unopposed Bills Committee of the House of Commons on March 23rd. It was explained by Mr. R. F. Parker, for the Corporation, that the existing tramways were authorised in 1901, and had been running ever since, but the time had come to consider whether they should be reconstructed, at great expense, or whether a more flexible and cheaper form of transport should be substituted. The Corporation had decided to substitute trolley vehicles. The borrowing powers asked for by the Bill are:—For trolley vehicles, £25,800; for electrical equipment, &c., £7,825; for the reconstruction of roads, £9,038; and for the adaptation of buildings for purposes of trolley vehicles, £200. Borrowing powers of £13,000 are also sought for the provision of omnibuses.

Overhead Transmission Lines.

On March 18th Sir D. Newton asked the Minister of Transport what number of applications were made by authorised undertakers for consent to the erection of overhead lines for the years ended March 31st, 1925, and 1926, respectively; and how many such applications had been made for the current year.

Colonel Ashley said that the number of applications received for the year ended March 31st, 1925, was 162 and for the following year 194. From April 1st, 1926, to March 18th, 1927, the number of applications received amounted to 322.

Wayleaves.

On March 18th, Sir D. Newton asked how many local inquiries in respect of wayleaves in connection with the placing of electric lines had been received during the current year; if delay had taken place in regard to inquiries into these matters; and how many officers had been appointed by the Ministry to deal with such questions.

Colonel Ashley said that five applications had been received during the current year. In one case the inquiry was delayed from February 9th to March 4th owing to the death of one of the parties. No official was definitely set apart for this work, individual appointments being made on each application.

Railway Electrification.

During a debate on the second reading of the London, Midland and Scottish Railway Bill on March 21st, a number of members complained of the inadequacy of the travelling facilities in the East End of London, and urged that the company should pay greater attention to the electrification of its lines and to the installation of electrical signalling.

Mr. Fielden, a director of the company, in reply, said that the company had asked its late chief engineer to inquire into the engineering problems in the London district. The question of electrification was one of them. One official was solely engaged in the consideration of schemes for meeting the future requirements of the traffic on the London and Southend sections; progressive electrification was one of them, and alterations and improvements at Broad Street were another. Steps were being taken to avoid delay owing to traffic movements, and additional running lines and facilities were being provided. The company was in process of adopting automatic signalling on the line between Barking and Bow. That work, it was hoped, would be completed by the summer.

Beam Wireless.

On March 22nd Sir W. Mitchell-Thomson informed Lt.-Commander Kenworthy that the "beam" wireless stations erected in this country for the Australian service had passed the seven-day test required by the contract and were about to be taken over by the Post Office. The sending station was at Grimsby and the receiving station at Skegness. The corresponding stations in Australia were at Ballan and Rockbank, near Melbourne; and it was proposed to operate the service between London and Melbourne. Many detailed arrangements had still to be made, and he could not yet state on what date the service would be opened to the public.

Wireless Operators.

On March 22nd Sir W. Mitchell-Thomson informed Mr. Day that the total number of certificates issued to ships' wireless operators during the 12 months ended March 1st, 1927, was 760.

Winding Gear in Collieries.

On March 22nd, Colonel Lane-Fox informed Mr. Paling that about 2,440 collieries had steam and 240 electric winding engines. In the five years 1922-26 58 accidents had occurred, causing injury to persons employed, including 14 deaths; since December 1st five such accidents had occurred, causing three deaths. One of the former, causing injury but not death, and none of the latter, occurred with an electric winder.

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Faults in Flexibles.

When I drew attention to this matter in your columns last year, in connection with a vacuum cleaner, no interest was taken; but at last people realise the dangers involved, not to mention the annoyance. But I notice that Messrs. Ward and Goldstone now recommend "Feraflex." I wrote to them about this at that time, and they then preferred another of their special wires, "anti-shock" flex, as "they did not consider 'Feraflex' altogether suitable." This is a little confusing, as they do not now mention "anti-shock" flex, though I am using it and have had no trouble since.

J. W. Meares.

Guildford, *March 27th*, 1927.

The Charges for Packages.

In your issue of March 18th Mr. W. Eric Jackson, LL.B., writes a very interesting article on this subject. In the second last paragraph, however, he states that the buyer may return the empty packages at the seller's expense. Strictly speaking, this is not the case, for our railway companies will accept empties only if consigned carriage-paid by consignor, and I have never heard of buyers issuing separate invoices to suppliers for the amount of carriage paid on empties returned by them. I shall be glad to have this point explained.

W. Jackson Harris.

Glasgow, *March 21st*, 1927.

In reply to your correspondent, Mr. W. Jackson Harris, I would say that where the delivery charges are to be borne by the buyer, as is usually the case, the cost of returning the empty package may be considered as part of the delivery charges. The seller bears the cost of making the goods deliverable, *i.e.*, packing them, and the buyer pays whatever other expenses are incidental to the process of delivery. Trade

custom also seems to operate in favour of charging the buyer with the carriage on the empty package. The rules of the railway companies do not affect the legal position. If a buyer is entitled to send back packages at the seller's expense he can charge him with what the railway company has charged. The buyer would be legally entitled to do this where the sale was "carriage free." In such cases no expense is to be borne by the buyer, and he can legally debit the seller with any expense incurred in returning empty packages.

W. Eric Jackson.

A Meter Problem.

With reference to the letter by "E.H.K.P.," which appeared in your issue of March 4th, it is somewhat surprising to find anyone expecting correct readings from instruments used with transformers other than those with which they have been calibrated.

If a discrepancy appeared in the readings in the original instance the only correct method of checking this was to install the new instruments with their transformers as a separate unit, leaving the old ones undisturbed.

Connecting up the old instruments, with the new, to the same transformers would probably have the double effect of not only affecting the old but the new instruments as well.

The remedy for the situation is either to recalibrate the old instruments with the new transformers or put the old ones in circuit again.

P. Oaks.

Blackheath, *March 19th*, 1927.

With reference to the correspondence resulting from my letter inserted in the Review of March 4th, may I encroach upon your space with the following information which I have since been successful in obtaining?

The enclosed table has been constructed from figures taken from the meters concerned. A similar set of readings for the portable meter is not available, because the Supply Co. locked that meter in a closed and sealed box. The only information I have been able to elicit is that the readings of the portable meter were fairly close to those of the Sangamo, but less in value.

	Sangamo.	Aron.		Difference.
			Max. demand,	
Week ending.	KWh.	KWh.	KW.	KWh.
11/1/27	—	7,690	178	—
18/1/27	—	8,070	178	—
25/1/27	—	7,750	168	—
1/2/27	10,580	6,860	138	3,720
8/2/27	10,870	6,690	138	4,180
15/2/27	11,110	9,660	209	1,450
22/2/27	9,980	9,270	192	710
1/3/27	10,500	10,060	—	440
8/3/27	10 090	9,760	—	330
15/3/37	9,740	9,460	—	280

It will be noticed that the first reading of the Sangamo is dated 1/2/27, and this is after it had recorded for a full working week. Simultaneously the Aron meter shows a sudden drop in both kWh and max. kW demand indications. Between 8/2/27 and 15/2/27 the cover of the Aron meter was removed, and some adjustment made to its interior, after which the max. kW returned to approximately the original readings, and the kWh approached more nearly to the Sangamo.

In my opinion, the only accurate and satisfactory method of testing the Aron equipment is to install the Sangamo complete equipment (upon its own transformers) independently of any other apparatus, as current transformers are most sensitive to alteration of the time-constant (X to R ratio) of their loads. Moreover, when the company concerned is one of the largest in London, one would expect the methods of its test department to be above criticism; surely it is only reasonable to suggest, when the accuracy of a meter is questioned, that the test should be as perfect as possible. The company has said no more with regard to charging for its presumed loss. I also cannot understand why, when the consumer is charged on a max. kVA basis, the max. kVA meter is ignored, and he is charged according to the indications of the max. kW as indicated by the Aron meter, although the power factor of the system is 0.8-0.85, and, according to a P.F. meter (connected by the company), lagging.

E. H. K.P.

March 19th, 1927.

The Salaries of Engineers.

In spite of the large number of communications already published on the subject of engineers' salaries, I feel bound to add my small contribution to the swelling chorus of protest. A glaring example is furnished by your "Situations Vacant" columns in the issue of March 25th. There we see vacancies advertised for positions as "Chief Engineers" in two workhouse institutions at salaries of such stupendous dimensions that the successful candidates will, no doubt, soon be able to fulfil the requirements necessary to obtain permanent positions as inmates. In this connection, too, it is noteworthy that the amounts which the guardians of these institutions are prepared to pay their employés, are strictly comparable with those which they "give away" to non-workers in the form of relief.

As one of the younger members of the electrical world, I think a word is necessary with reference to the salaries paid to college-trained men, just emerging from their studies, blushing under their many academic successes. A rude shock awaits them in the form of offers, few and far between, of positions carrying salaries which a well-trained office-boy would reject with contempt.

I think the position may be summed up by adapting the famous words of *Punch*:—

Advice to those about to become engineers:—Don't!

Advice to those who are engineers:—Give it up and try cat burglary.

Embryo.

March 26th, 1927.

In view of the interest of your readers in the scheme of the S.T.E. to raise both the remuneration and status of engineers, may I be permitted to add my wee small voice to the chorus?

Your correspondent who sums up our trouble as one of supply and demand, is surely right. It is that, and that only. What is the position outside engineering?

In those several kinds of businesses, *e.g.*, large distributing stores, hotels, breweries, amusements, silk stockings, &c., that have done well right throughout the general slump in our basic industries, is there any higher general wage and salary standard than obtains in those languishing industries, engineering, shipbuilding, mining, &c.? No, Sirs, we know there is not; salaries and wages are at a dead level throughout industry, quite regardless of the prosperity of the particular industry and the ability of its directors to pay high salaries. The law of supply and demand inexorably operates. We of the present generation are suffering from the unrestricted over-production of population of the last century. Would that there had been a Parents' Association on the lines of our modern Rubber Growers' Association, Tea Growers' Association, &c. Even now, Sirs, our population is still increasing at the rate of round about a million every four years, a large proportion of them, no doubt, destined to be engineers, or should I say, part-time engineers? What are we going to do with all these people? Is the law of supply and demand going to operate still more inexorably for our children, grown to engineers, than even for us?

If the S.T.E. scheme could be realised, no doubt it would help engineers by limiting their numbers, but only by pushing would-be engineers into other already overcrowded professions with consequent intensified competition between their members, with the usual dire results. I must confess myself a pessimist, I see no way out—with our present size of population.

Sociologist and Engineer.

March 26th, 1927.

The Register of Contractors.

THE annual meeting of the National Register of Electrical Installation Contractors was held at the Institution of Electrical Engineers on Monday last, Mr. P. V. Hunter, C.B.E., chairman, presiding. The report of the Executive Committee which was presented made mention of a publicity campaign carried out during the year, and it was stated that a further campaign was being embarked upon. The figures relating to registration showed that since the inception of the scheme up to December 31st last there had been 1,173 applications. Of these, 946 had been accepted, 116 declined, and 17 withdrawn, while 41 were still under investigation. The number of registrations cancelled and names struck off the Register was 52, only two cases being on account of bad workmanship. Since the end of the year a further 30 applications had been accepted. Mr. Purse's paper on "Registration," which was read at the Brighton Conference of the E.C.A. Allied Associations, was reprinted and circulated to supply authorities, architects, consultants and others. There are now 86 local advisory committees with their full complement of three members, and 20 others are functioning, although not yet up to number. The following undertakings now place their installation work with registered contractors only:—Manchester, Hull, Wolverhampton, Bristol, Preston, Croydon, Newport, Cheltenham, West Hartlepool, South Shields, and the Newcastle-upon-Tyne Electric Supply Co., Ltd. It has been arranged to issue renewal certificate slips to obviate the annual exchange of certificates. During the year three complaints of bad workmanship were received. The Executive Committee decided that it could take no action in one case; in the second case the responsible contractors were struck off the register; and in the third case the firm went into liquidation, thus forestalling the cancellation of its certificate. The E.C.A. passed a resolution calling upon the Register to adopt a code of wiring rules, and a meeting is being arranged with the E.C.A. The retiring members of the Registration Board were re-elected, but Mr. Barnett was elected in the place of the retiring representative of the Electrical Wholesalers' Federation.

In replying to a criticism of the accounts, both the Chairman and Mr. W. R. Rawlings claimed that the Register was run in a very economical manner. Replying to Col. Crompton, Mr. Hunter said that he had heard, unofficially,

that the E.C.A. had decided to adopt a set of wiring rules. Mr. A. H. Dykes seconded the adoption of the report, and it was carried.

A member asked for fuller definition of the local advisory committees' functions. Mr. H. J. Cash pointed out the present need for propaganda, which should aim at showing that registration did not increase costs. He regretted that it had not proved possible for the Register to adopt the I.E.E. Wiring Rules. No doubt their adoption would deplete the Register for a time, but those that were left could pay a larger subscription to make up for that. Mr. W. A. Shaw said that many large firms were not yet on the Register; he was informed that there were 350 members of the E.C.A. not yet registered. He suggested the certification of the competency of contractors by the municipal supply engineers, who would then take a keener interest in the register. Col. Crompton said that the present I.E.E. Rules were far too complicated, and they were only temporary. They needed more easily understood rules. That was being done, and he commended the summary produced by the E.C.A. for the use of its members. Mr. W. Cross said that there were complaints that individuals had been put on the Register who were not strictly electrical contractors. Many contractors considered that the business qualification requirements should be stiffened up. He also urged the adoption of wiring rules. Mr. F. W. Purse thought that even the "small" man should be registered if he fully complied with the conditions; it was easy to cancel his registration if he proved incompetent, which was all the worse for the man concerned. Mr. Hunter said that there was a member of the E.C.A. on every local advisory committee, which should prove a safeguard. The Executive Committee was more stringent in its requirements from the small man. Messrs. P. V. Hunter and A. H. Dykes were re-elected chairman and vice-chairman respectively. The rule regarding the status of applicants was amended to enable the Executive to require candidates to submit particulars of past work. The members of the Executive Committee, Messrs. Munro, Calvert and Rawlings, were re-elected. Mr. L. Gaster suggested that the Register should be a means of enabling the placers of orders to look up the past work of contractors. The chairman said that the Executive would consider the matter, although he thought it was beyond the scope of the Register. On the proposition of Mr. Purse, it was resolved to subscribe five guineas to the I.E.E. Benevolent Fund. Votes of thanks to Messrs. Cash and Purse (the Scrutinising Committee) and the chairman concluded the meeting.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

21,846. "Transmission and reproduction of views, scenes, or images by wires or wirelessly." Television, Ltd., and J. L. Baird. September 1st, 1925. (266,564.)

23,347. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). October 10th, 1925. (Addition to 179,930.) (266,774.)

26,615. "Electrical condensers." Karas Electric Co. August 1st, 1925. (256,167.)

27,951. "Electric accumulators." C. H. O. Lubeck. October 31st, 1924. (242,230.)

27,496. "Sparking plugs." F. J. Buckingham. November 2nd, 1925. (266,778.)

27,724. "Armatures for asynchronous motors." C. Shenfer and English Electric Co., Ltd. November 4th, 1925. (Addition to 234,191.) (266,780.)

27,788. "Construction and windings of armatures for electric generators or motors." F. W. Lanchester and Lanchester's Laboratories, Ltd. November 5th, 1925. (266,782.)

29,468. "Thermionic valve amplifiers, automatic distribution systems." O. D. Edmonds. November 21st, 1925. (Cognate applications 6,843/26 and 9,672/26.) (266,788.)

29,475. "Device for obtaining easy starting of internal-combustion engines fitted with magneto ignition." E. M. Dodds. November 23rd, 1925. (266,790.)

29,724. "Telephone systems." Standard Telephones & Cables, Ltd., J. H. E. Baker, W. R. Moscrip, and A. J. Chanter. November 24th, 1925. (266,794.)

29,785. "Thermionic valve sockets." Hazeltine Corporation. May 21st, 1925. (252,315.)

29,865. "Electric storage batteries." Feolprufe Patent Accumulator Co., Ltd., and F. J. Brown. November 26th, 1925. (266,797.)

29,904. "Improvements in or relating to electric signalling systems." J. M. E. Aitken, D. A. Gordon and Metropolitan-Vickers Electrical Co., Ltd. November 26th, 1925. (266,798.)

30,014. "Electric motors." W. M. Mordey. November 27th, 1925. (266,799.)

30,218. "Rotary switches for use with electrical apparatus for transmitting signals." M. Graham, A. Graham (legal representatives of E. A. Graham, deceased), and A. C. Brockies. November 30th, 1925. (266,802.)

30,248. "Electrolytic decomposing cells." F. Lawaczeck. November 30th, 1925. (266,803.)

30,379. "Electrical contacts." British Thomson-Houston Co., Ltd., and E. B. Tuppen. December 3rd, 1925. (266,811.)

30,666. "Electric relays." A. Reyrolle & Co., Ltd., and B. H. Leeson. December 4th, 1925. (266,816.)

30,697. "Apparatus for signalling the extinction of electric lamps." E. N. Bray, Ltd., and E. N. Bray. December 4th, 1925. (266,818.)

30,782. "Supporting of electrical conductors within tubular insulators." K. G. Maxwell and Metropolitan-Vickers Electrical Co., Ltd. (Cognate application 21,743/26.) (December 5th, 1925. (266,822.)

30,882. "Automatic switches for use in telephone or like systems." Automatic Telephone Manufacturing Co., Ltd. December 9th, 1924. (244,458.)

31,763. "Electrically-driven lawn mowers." H. Watson & Sons, Ltd., and E. Watson. December 16th, 1925. (266,844.)

1926.

45. "Dry batteries." Burgess Battery Co. January 2nd, 1925. (245,464.)

107. "Synchronous dynamo-electric machines." Crompton & Co., Ltd., and R. A. Lochner. January 2nd, 1926. (266,853.)

307. "Electric cables." W. T. Henley's Telegraph Co., Ltd., and W. W. Watkins. January 5th, 1926. (266,855.)

1,193. "Electric switches." C. L. Arnold and M.K. Electric, Ltd. January 15th, 1926. (266,863.)

1,295. "Choke transformers for wireless telephony." R. Woods. January 16th, 1926. (266,865.)

2,108. "Combined arc lamp and radiator." J. R. Quain. January 25th, 1926. (266,872.)

3,399. "Tension regulating by means of asynchronous wattless current machines." Siemens-Schuckertwerke Ges. February 27th, 1925. (248,344.)

3,607. "Irradiation apparatus for treating fluids with ultra-violet rays." Quarzlampen Ges. February 9th, 1925. (247,231.)

4,072. "Switch-operating mechanism for electric transformers." Bruce Peebles & Co., Ltd., and J. W. Rodger. February 12th, 1926. (266,890.)

4,074. "Electric transformers." Bruce Peebles & Co., Ltd., and J. W. Rodger. February 12th, 1926. (266,891.)

4,436. "Electrical signalling devices." Dr. M. J. Hulzinga. February 18th, 1925. (247,953.)

5,588. "Electric converting apparatus." J. E. Calverley and W. E. Highfield. February 27th, 1926. (266,902.)

13,074. "Electrostatic sound-box for talking machines." W. Groenebaum. May 21st, 1926. (266,949.)

14,176. "Braking systems." British Thomson-Houston Co., Ltd. June 4th, 1925. (253,136.)

15,010. "Alternating-current vapour electrical devices." Hanovia Chemical and Manufacturing Co. February 23rd, 1926. (266,963.)

15,377. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). June 18th, 1926. (266,965.)

15,512. "Electric luminous discharge tubes." General Electric Co., Ltd. November 4th, 1925. (260,943.)

16,822. "Synchronised asynchronous electric motors." J. Rezelman. July 5th, 1926. (266,976.)

17,885. "Electric arc-welding process." W. Kassteen. July 16th, 1926. (266,981.)

18,045. "Apparatus for treating gases and vapours with silent electric discharges." W. Carpmael (I. G. Farbenindustrie Akt. Ges.). July 19th, 1926. (266,983.)

18,147. "Method of producing coloured lighting effects for signalling, advertising, and kinematographic purposes as well as for illuminating fountains or the like." B. Jirotka. August 12th, 1925. (256,938.)

20,285. "Switch-actuating mechanism for electric signs." E. S. Andrews (Elektro-Automaten, M.B.H.). August 17th, 1926. (266,994.)

21,926. "Electric incandescent lamp." Dr. G. Von Mery and R. Basch. September 6th, 1926. (267,009.)

23,831. "Electric flat irons." H. Golob. September 25th, 1925. (258,907.)

24,316. "Synchronisation of alternating-current systems." International General Electric Co., Inc. October 1st, 1925. (259,235.)

24,827. "Picture and the like telegraphy." Telefunken Ges. fur Drahtlose Telegraphie. October 7th, 1925. (259,584.)

25,965. "Electric starting machines for motor vehicles." Soc. de Paris et du Rhone. November 24th, 1925. (262,064.)

29,493. "Electric welding machines." E. G. Budd Manufacturing Co. November 24th, 1925. (262,104.)

31,215. "Electric lamps." R. C. Turner. December 9th, 1926. (267,054.)

31,940. "Electric glow-discharge lamps." Television, Ltd., and J. L. Baird. September 1st, 1925. (Divided application on 306,564.) (267,056.)

32,805. "Apparatus for feeding oil to high-tension electric cables." Pirelli & Co. June 12th, 1926. (Addition to 255,034.) (Divided application on 255,034.) (267,059.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 23rd:—

Magnet (design only). No. 471,778. Class 1. No. 471,779. Class 1 (lettering only). Chemical substances used in the manufacture of goods exclusively for electrical purposes.—General Electric Co., Ltd.

Televisor. No. 464,125. Class 8. Apparatus for use in transmitting views, scenes, or images to a distance by telegraphy.—J. L. Baird, The Lodge, Argyle Street, Helensburgh, Scotland.

Mer-tone (lettering and design). No. 474,831. Class 8. Loud speakers for radio-telephonic instruments.—London Radio Manufacturing Co., Ltd., 61, Borough Road, S.E.1.

Omicron. No. 477,713. Class 8. Apparatus for use in radio-telegraphy and telephony.—W. L. Colassi and G. Ventura trading in co-partnership, 130, Fenchurch Street E.C.3.

Accident Prevention.

The Accident Prevention Department of the National Employers' Mutual General Insurance Association, Ltd., informs us that one of its member firms has just reported a reduction of accident loss by 87.5 per cent., on a man-hours-worked basis. The Department issues posters weekly, suitable for display in factories, and has started a monthly paper styled "Industrial Safety," an interesting 8-page journal containing a variety of information calculated to reduce the frequency of accidents. A note therein recommends the painting of crane hooks white, so that they are more easily seen and fewer heads are broken—unpainted, they are difficult to see against a dark background. Methods of preventing falls from ladders, on stairs, &c., are described, and the use of flashing electric signs to attract the attention of employés to safety "slogans" is said to have proved highly effective. Too much effort cannot be devoted to the prevention of accidents, and the Department is anxious to help all employers to that end.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AUSTRALIA (Adelaide).—Bridge (£70,000); city engineer.
(Hobart, Tasmania).—Reconstruction Sandy Bay Baths; Corporation engineer.
AYRSHIRE.—Housing scheme (162), for the C.C.; the clerk, Ayr.
BARNSLEY.—Municipal wash-houses and Turkish baths; borough engineer. Casualty and out-patients' buildings, Beckett Hospital; C. F. Moxon, architect, Regent Buildings.
BARNSTAPLE.—Housing scheme (22), for the T.C.; borough surveyor.
BASINGSTOKE.—126 houses, Hackwood Road; borough engineer.
BEBINGTON (Birkenhead).—Church (£7,000), for the Wesleyan trustees; Rev. F. A. Speight.
BEESTON.—42 houses; U.D.C. surveyor.
BRADFORD.—Central improvement scheme, including six-storey block (over £200,000); W. Williamson, city architect.
BRIGHTON.—Reconstruction of station (£90,000), for the Southern Railway.
BROMLEY (Kent).—Houses (92), Bromley Park Garden Estate, for Hugh F. Thoburn. Seven blocks of flats (£13,720), for the T.C.; J. Elliman & Son, Ltd., builders.
BURSLEM.—Extensions marl works, High Lane; Mr. Wilkinson.
CHADDERTON.—Extension of works, Halliwell Street, for Ferranti, Ltd., electrical engineers.
CROYDON.—Extensions, High School; Girls' Public Day Schools Trust. Bank, Brighton Road; Midland Bank, Ltd. Kinema, High Street; R. Cromie, 73, Edgware Road, W.2. 24 shops and flats, Dovercourt Parade North; Robin & Wilsdon, 39, Maddox Street, W.1. Warehouse, 252, London Road; C. H. Ridge.
(Addiscombe).—Flats, Park Hill Road and Addiscombe Road; W. H. Merret & Sons, Carshalton Road, Sutton.
DERBY.—Church (£6,000), for Junction Street Baptist Church; J. Wills & Sons, architect.
DONCASTER.—Houses (80), Bawtry, for the R.D.C.; Ward and Sons, builders, Maltby.
EASTBOURNE.—Additions, Victoria Hotel, Latimer Road; A. Ford, architect.
EDINBURGH.—Extensions at dancing academy, 22 and 24, Albany Street; G. Dickson.
FALKIRK.—Extensions at foundry (£1,400), for Messrs. R. and A. Main, Gothic Iron Works, Camelon; the manager. Reconstruction scheme for Falkirk and Counties Savings Bank (£9,100); J. G. Callander, architect, Royal Bank Buildings.
GILDERSOME.—Rag and mungo warehouse, for W. Morris, Springfield Mills; W. Wilby, Council House.
GRANGEMOUTH.—Reconstruction of buildings for Macpherson & McLaren, timber merchants; Wilson & Tait, architects.
GREENOCK.—Super-kinema, with café and dance hall, for Greenock Picture Palace Company; the secretary.
GRINDLEFORD (Sheffield).—Public hall (£6,000); Major Ross-Innes, President, Public Hall Committee.
GLASGOW.—Clinic, Kennedy Street; medical officer of health.
HAMPTON WICK.—Parish hall (£5,073), for St. John's parish; A. J. Hardwick, architect, Eagle Chambers, Kingston-on-Thames; Bernard & Picket, builders, Wallington.
HUNSLET.—Shed, Stourton Works, for Bramley Engineering Co., Ltd.; J. A. Webster, architect, 12, Hanley View, Bramley.
IRISH FREE STATE.—(Clonakilty, Co. Cork).—Reconstruction of wing at the County Home for the W. Cork County Board of Health; J. J. Crowley, architect.
(Skibbereen, Co. Cork).—Hospital for the West Cork County Board of Health; J. J. Crowley, architect, Clonakilty.
(Cork).—Farm buildings, dairy, and dairy institute, University College; H. H. Hill, 22, George's Street, architect.
(Limerick).—Dock extension (£150,000), for the Harbour Board.
KINROSS.—Additions to Green Hotel (electric lighting and central heating); Sir Basil Montgomery, director, Green Hotel, Kinross, Co., Ltd.
LONDON (Hackney, E.).—Rehousing scheme, Wells Street; L.C.C. architect.
(Stepney, E.).—89 tenements and 10 shops, Vallance Road; borough engineer.
(Hornsey, N.).—Elementary School, Coldfall site; Education Committee.
(Stoke Newington, N.)—Workshop extensions, 166-168, High Street; Eley & Allen.
(Wood Green, N.W.).—Elementary School, Albert Road; Education Committee.
(Battersea, S.W.).—Seventh block of tenements, Plough Road; borough engineer.
(Brentford, W.).—Houses on Gunnersbury Park Estate; Douglas Smith & Barley. 10 shops, Lionel Road; E. Haydon. Sports pavilion, Metropolitan Railway Works, Acton Town; W. Downs, Ltd. Factory, Great West Road. Industrial Constructions, Ltd.
LYTHAM ST. ANNES.—80 houses on three estates; borough engineer.
MAIDSTONE.—Schools (£29,000), Loose, for the borough E.C.; T. F. Bunting, borough surveyor.
MALVERN.—Additional housing scheme (34), for the U.D.C.; W. O. Thorp, surveyor.
NEWCASTLE.—Shopping centre, Walker housing estate; city engineer.
NEWTON-IN-MAKERFIELD.—Housing scheme (154), South Mesnes; J. Elson, architect, Market Chambers, Earlestown.
NORTHOP HALL (Flintshire).—Institute, for the Miners' Welfare Committee; F. A. Roberts, architect, Earl Chambers, Mold.
OLD FLETTON (Peterborough).—Housing scheme (120), for the U.D.C.; H. W. Hawkins, architect.
PAIGNTON.—Hospital accommodation; U.D.C. surveyor.
PENKRIDGE (Staffs).—Wesleyan Church, Wolverhampton Road; F. Jones, Otherby Cottage.
PENRITH.—Improvements, Market Hall; U.D.C. surveyor.
PITSTONE (near Aylesbury).—Cement works, Associated Engineering & Finance, Ltd., London, promoters.
RISHWORTH.—Church of St. John the Divine; Walsh and Maddock, architects, Halifax.
ROCHDALE.—Offices and showrooms, Samuel Street, for Electricity Department (£20,000); borough engineer.
ROTHERHAM.—Sewage works, for R.D.C.; C. O. Rawstron, engineer and surveyor, Grove Road, Moorgate.
RYDE (I. of W.).—Pavilion, Eastern Esplanade; borough engineer.
ST. HELENS.—600 houses, various estates; borough engineer.
SHIPLEY.—Extensions, wool warehouse, Otley Road; Wicksteed & Andrea.
SHREWSBURY.—Museum alterations; Curator.
SKEGNESS.—Secondary Schools, for Lindsey E.C.; director of education, Lincoln.
SOUTH AFRICA (Cape Town).—Schemes to cost £500,000 for various improvements; city engineer.
SOUTHEND-ON-SEA.—School (800 places), for the borough E.C.; A. B. Kelly, director of education. Sanatorium extensions, for the T.C.; borough surveyor.
STIRLINGSHIRE.—Hall at Fallin for West Stirlingshire Unionist Association; the secretary, Stirling.
STOKE-ON-TRENT (Hanley).—Temporary art gallery, School of Art; city engineer. 196 houses, Stoke Lodge Estate; Sutton Trustees. Office accommodation, engineers' department; city engineer.
SWANSEA.—Shops and offices, Union Street and Orange Street; W. C. Phillips-Powell, Cardiff.
THORNTON HEATH.—179 houses, Dixon Road, and other streets; W. H. Aston, Dixon Road.
TORQUAY.—Alterations, Princess Hall, Princess Street; Trustees.
WALSALL.—Additional 536 houses, for the T.C.; borough surveyor.
WALTON-ON-THAMES.—Houses (78), for the U.D.C.; David Weston & Co., Ltd., builders, Blackfriars House, New Bridge Street, London.
WELLINGBOROUGH.—Infirmary and extensions to nurses' block, for the B.G.; Talbot, Brown & Misher, architects, Burystead Place.
WHITEFIELD.—Housing scheme (38), Nipper Lane; C. F. Porter, clerk to U.D.C.
WITTERSHAM (Kent).—Residence, for Mr. Jowett, K.C.
WOLVERHAMPTON.—Infant welfare clinic, Lea Road, for the T.C.; town clerk. Block of business premises, Victoria Street, for Horton's Estates, Ltd.
WORSBOROUGH.—Housing scheme (36), Ward Green, for the U.D.C.; T. Shield, surveyor.